

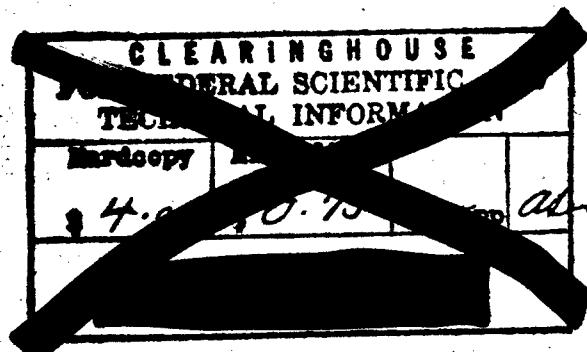
AD640130

Technical Report

AD 640 130

MECHANIZATION STUDY
OF THE VESIAC, BAMIRAC,
AND IRIA INFORMATION CENTERS,
UNIVERSITY OF MICHIGAN

BOOZ · ALLEN APPLIED RESEARCH INC.



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MECHANIZATION STUDY
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UNIVERSITY OF MICHIGAN

Submitted to

Defense Supply Agency
Defense Documentation Center
Cameron Station, Virginia

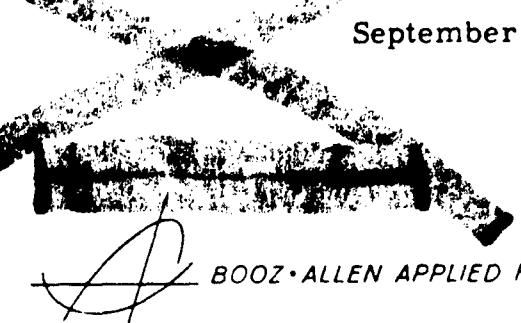
by

Booz, Allen Applied Research Inc.
4733 Bethesda Avenue
Bethesda, Maryland 20014

Under Contract No. DSA-7-15489

BAARINC Report No. 914-1-36

September 1966

 BOOZ-ALLEN APPLIED RESEARCH INC.

WASHINGTON
CLEVELAND
CHICAGO
LOS ANGELES

4807458010000000

ABSTRACT

Three information and analysis centers of the Institute of Science and Technology, University of Michigan, utilize the computer and EAM facilities of the Institute's Computation Department for retrieval of bibliographic references based upon the Computation Department's generalized retrieval system. The three centers are Infrared Information Analysis Center (IRIA), VELA Seismic Information Analysis Center (VESIAC), and Ballistic Missile Radiation Analysis Center (BAMIRAC). IRIA utilizes the mechanized retrieval program, which uses an IBM 1401 computer, to produce two listings. VESIAC is in the pilot stage of producing demand bibliographies using the mechanized information retrieval program. BAMIRAC utilizes an optional arrangement of manual, EAM, and mechanized techniques to provide demand bibliographies including abstracts. The development of a generalized retrieval program for all three centers has eliminated the need for the more costly process of maintaining a specialized program for each center. Because of center similarities, this general program fits each center's requirements without significant difficulty.

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A P P E N D I C E S

IRIA DOCUMENTS PROCESSING

BAMIRAC DOCUMENTS PROCESSING

ATTACHMENT: INFORMATION RETRIEVAL AT
THE INSTITUTE OF SCIENCE AND TECHNOLOGY

IRIA FILE STRUCTURES

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1. SUMMARY

I. SUMMARY

Three information and analysis centers of the Institute of Science and Technology of the University of Michigan were studied and are discussed in this report. These centers are:

1. Infrared Information Analysis Center (IRIA)
2. VELA Seismic Information Analysis Center (VESIAC)
3. Ballistic Missile Radiation Analysis Center (BAMIRAC)

All three centers utilize the computer and EAM facilities of the Institute's Computation Department for their mechanized processes. These processes, while differing somewhat among the three centers, are confined to retrieval of bibliographic references based upon the Computation Department's generalized retrieval system.

The centers are summarized in the following paragraphs:

1. IRIA

The IRIA Center was established with tri-service sponsorship for the collection, analysis, and dissemination of information about infrared research and technology (0.7 to 200 micron region), with particular emphasis on military aspects. IRIA utilizes the mechanized retrieval program to produce annotated and demand bibliographies and uses EAM equipment to

duce two listings: Contract Number vs. IRIA Number and AD
umber vs. IRIA Number. In addition, IRIA manually publishes
ate-of-the-art reports and the Proceedings of the Infrared Information
Symposia. Twelve thousand documents make up most of the IRIA
collection, and these are increasing at a rate of about 2,000 documents
per year. Requests for information are received by telephone, letter,
or personal visit, visits averaging about seven per month. The services of
the Center are available to all users who can establish the necessary
clearance and need-to-know.

VESIAC

The mission of the VESIAC Center is to provide the Advanced
Research Projects Agency (ARPA) of DoD with a facility for the collection,
processing, analysis and dissemination of technical information relating
to underground nuclear test detection. The Center is in the pilot stage
of producing demand bibliographies using the mechanized information
retrieval program, and is manually producing a monthly acquisition list.
It also publishes and distributes information digests and news bulletins.
The collection currently consists of approximately 13,000 documents, of
which about 3,000 have been keypunched to date for the information retrieval
program. The collection also includes about 50 periodicals in the field
of seismology. The entire collection is currently expanding at the rate of

about 2,000 documents a year. Information services are provided to the entire DoD community, within the restrictions of need-to-know and security. Requests for information may be received by telephone, letter, or personal visit. A lending service is also operating at the rate of 200 to 300 items monthly.

3. BAMIRAC

The function of the BAMIRAC Center is the collection, processing, analysis and dissemination of information on ballistic missiles and space vehicles, particularly concerning electromagnetic radiation. BAMIRAC's information function especially relates to defensive measures that may be taken against ballistic missiles and space vehicles. Its collection consists of about 8,500 documents; this increases at a rate of about 1,200 documents per year. (About twice as many documents are screened for relevance as are actually added to the collection.) The Center conducts its own investigations in its areas of interest as well as analyzing external information sources. It utilizes an optional arrangement of manual, EAM, and mechanized techniques in providing demand bibliographies (including abstracts). The Center also manually publishes its own technical reports, acquisition lists, and the Proceedings of the Anti-Missile Research Advisory Council. Its facilities and services are available to all users who possess the necessary clearance and have need-to-know.

II. MECHANIZATION

II. MECHANIZATION

1. CHRONOLOGY

(1) IRIA

This Center began as a small library in 1954. In the period 1957-1962, IRIA's bibliographic references were converted to McBee Keysort cards. In 1962, IRIA began its mechanization program primarily to reduce the two to three days time required to search its files. A reduction of this time to a matter of hours was to be a goal of the mechanization, the first step of which was the direct conversion of McBee cards to EAM punched cards. The existing format was maintained, but descriptors were added to permit a more rapid search. The conversion was completed in 1963, and the mechanized information retrieval system was then put into full operation. Since that time, the number of requests has increased by a factor of five, chiefly as a result of the speedier service.

(2) VESIAC

As a result of an increasing number of requests for demand bibliographies and other locally generated publications, VESIAC began, in the spring of 1965, to convert its retrieval system to the

generalized machine retrieval program of the Computation Department. The first step after reviewing the IRIA and BAMIRAC system was to develop the desired formats and to order the necessary EAM equipment. Keypunching of bibliographies, data, and abstracts began in late May, and, by October, references for about 300 documents had been entered on the EAM cards. It is expected that the entire collection will be covered in this way by April 1967. The introduction of the Universal Decimal Classification system for subject classification is also anticipated.

(3) BAMIRAC

This Center began to consider the use of EAM methods for information retrieval in August 1959. The first system was planned for the IBM 709, but this was later abandoned because of format problems. By July 1961, the compilation of the Missile Résumé File was started, to meet a need to relate information in terms of specific missile firings. This file was keypunched on EAM cards, and a retrieval system using the IBM 1401 was developed. By June 1962, Résumé File mechanization was complete. By this time, the Keyword File had also been keypunched, and an IBM 083 sorter had been acquired for searching this file.

2. DESCRIPTION OF PROCESSES -- IRIA

(1) Input Procedures

1. When a new document is received, it is screened first for pertinency and then to determine whether it duplicates data already in the file.
2. The document is then logged in and assigned a sequential IRIA number.
3. Using the "Instructions for Using Information Punching Form" (see Appendix A-1), the indicated descriptive information is entered on the "IRIA Analysis Form" (see Appendix A-2), which is then attached to the document. The contract file is checked to determine if the document contract number (if any) is already listed. If it is, the IRIA number of the document is added to the contract file card. If not, a new card is prepared. Samples of the contract file cards are given in Appendix A-3.
A check is also made to determine if the document has already been reviewed by BAMIRAC.
4. Processed documents are then collected and delivered to an IRIA staff member for annotation. The annotation (a brief description of the document) is written on the back

of the Analysis Form.

5. Descriptor codes are assigned indicating category words, category numbers, report type, and an evaluation code. The following extract from the document "Instructions to IRIA Reviewers", dated 14 April 1965, describes the use of these codes:

The quality of the report reviewing is the key to the retrieval system. Unless a report has been thoroughly described both by category words, category numbers, report type and evaluation code, retrieval becomes from difficult to impossible.

A comparison of two sample reviews is made here to illustrate how a poorly reviewed report can be lost in the retrieval system. This sample report is on missile nose cone re-entry data. The report type and evaluation code are disregarded to afford clarity.

| | Category Numbers | Category Words |
|------------------|---------------------------------|------------------|
| <u>Correct</u> | 7.1.0 (IR general spectra) | EMSN (emission) |
| | 2.1.0 (thermal sources) | SPTR (spectra) |
| | 3.2.5 (target emission-missile) | NOCO (nose cone) |
| <u>Incorrect</u> | ----- | ----- |
| | 2.1.0 (thermal sources) | ----- |
| | 3.2.5 (target emission-missile) | NOCO (nose cone) |

In the incorrect example, the category numbers and category words are correct but the description is insufficient. Many people who are interested in document retrieval may just use one descriptor word or category number and expect that all pertinent documents will be printed out in an IBM search. For example, if the descriptor word spectra (SPTR) were used in this particular document, although it contains many spectral curves would not be retrieved unless it was correctly reviewed. In other words, it is almost impossible to find a document that has too many descriptor words or category numbers. Our major concern is whether we have left enough computer space for numbers and words to adequately describe all documents. Remember that not all infrared workers have the same interests and problems you have; be as objective as possible. It is probably easiest to fill out the analysis form from the bottom up. Specify a primary category number from the dictionary of category numbers. Then if the report warrants, secondary and tertiary numbers should be added. Then a report type, and finally an evaluation should be specified. The evaluation applies to the first category or the report as a whole. It does not mean that the report is necessarily e.g., "excellent" on the second category. Finally, three category words which are individual, unordered words may be specified. Before you are finished, you should look at the annotation to see if you have any changes to suggest.

6. The codes are entered on the Analysis Form using the "Instructions to Reviewers for Filling Out Information Punching Forms" shown in Appendix A-4. Examples of the codes used are given in Appendix A-5 and A-6.

7. The information on the form is then keypunched on EAM cards as indicated on the punching form. A sample card is shown in Appendix A-7 with the document title

typed on as a manual search aid. The annotation is keypunched on a separate set of up to 19 EAM cards using columns 7 through 51.

8. The cards are sorted, and a printout of the information is obtained. This is edited, and the corrected card data is placed on tape for retrieval. The cards are sent to the Computation Department once a month for a final listing for proofreading. The magnetic tape, which is a cumulative file of all of the cards, is updated every three months. A duplicate card is produced for a backup file.

(2) Outputs

IRIA produces two kinds of mechanized outputs: a classified quarterly annotated bibliography, and demand bibliographies. The latter generally do not contain the annotations. (For sample demand bibliography, see Appendix A-8.) Two types of listings are also produced with EAM equipment: Contract Number vs. IRIA Number and AD Number vs. IRIA Number.

3. DESCRIPTION OF PROCESSES -- VESIAC

(1) Input Procedures

1. When a new document is received, it is screened first

for pertinency and then to determine whether it duplicates data already in the file.

2. The document is then logged in and assigned a sequential VESIAC number.

3. At this point, the manual system calls for the entering of document data on four files of 3 x 5 cards and a strip card 'VU' file. The files are : Accession Number, Title, Author, Corporate Author, and Project Contract Number (VU).

4. Processed documents are then collected and delivered to a VESIAC staff member for abstract preparation or abstract enrichment (as required).

5. Descriptor codes are assigned, and the document is then stored by accession number.

6. In the developing mechanized system, the following EAM cards are prepared:

| <u>Columns</u> | <u>Description</u> |
|----------------|--|
| | <u>Card 1</u> |
| 1-6 | VESIAC number |
| 7-9 | Secondary VESIAC number, if applicable |
| 10-11 | Card code |
| 12-13 | Card continuation number (if any) |

| <u>Columns</u> | <u>Description</u> |
|----------------|---|
| 14-23 | AD number |
| 24-33 | Report number |
| 34-73 | Primary and secondary contract numbers |
| 75 | Translation code when applicable |
| 77 | Thesis code, if document is thesis |
| 78 | Official-use-only code, when applicable |
| 79-80 | VU code |

Card 2

| | |
|--------|--------------------------|
| 14-53 | First and second authors |
| 60 -69 | Date of document |
| 75 | Document code |

Card 3

| | |
|-------|--|
| 14-53 | Third and fourth authors (when these exist) |
|-------|--|

Card 4

| | |
|-------|------------------------------|
| 14-75 | Corporate author and sponsor |
|-------|------------------------------|

| <u>Columns</u> | <u>Description</u> |
|----------------|--|
| | <u>Card 5</u> |
| 14-63 | Remainder of information on first corporate author |

Cards 6 and 7

| | |
|-------|---|
| 14-63 | Identification of the second or joint corporate author if there is one. |
|-------|---|

(If the document being indexed is an article from a journal, the name of the journal will be entered in the place of the corporate author. ASTM STP No. 329 (CODEN) will be used as the thesaurus of code words for journal titles.)

Cards 8-10

| | |
|-------|-------|
| 14-63 | Title |
|-------|-------|

Cards 11-2

| | |
|-------|-------------|
| 14-43 | Descriptors |
|-------|-------------|

Cards 22-35

| | |
|-------|----------|
| 14-72 | Abstract |
|-------|----------|

| <u>Columns</u> | <u>Description</u> |
|----------------|--------------------|
|----------------|--------------------|

| | |
|--|----------------|
| | <u>Card 36</u> |
|--|----------------|

| | |
|-------|-----------------|
| 14-63 | End of abstract |
|-------|-----------------|

The cards are then sent to the Computation Department for updating the VESIAC file and for retrospective searches using the generalized program.

(2) Outputs

Demand bibliographies, currently without abstracts, are machine produced, based upon descriptor searches. A monthly accession list will also be machine produced, and plans are being made for a yearly cumulative accession list.

DESCRIPTION OF PROCESSES -- BAMIRAC

(For flow chart of BAMIRAC documents processing, see Figure 1.)

(1) Input Procedures

1. When a document is received, it is screened for duplication and pertinency to the subject matter of the Center.

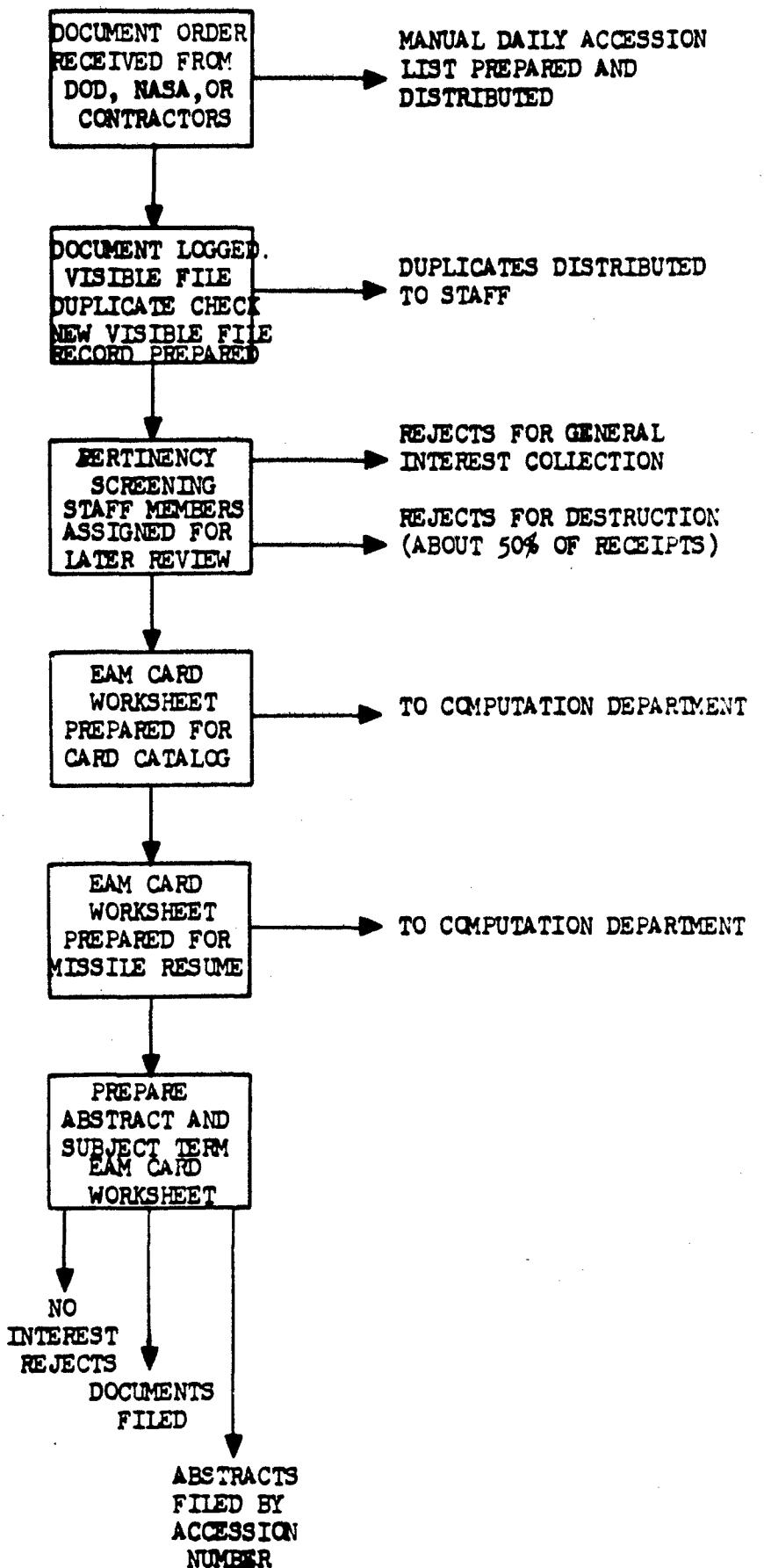


FIGURE 1

BAMIRAC Document Processing Flow Chart

2. If a decision is made to add it to the collection, an Accessions Information Form (see Appendix B-1) is prepared for it, showing the BAMIRAC (accession) number assigned to it, author, title, contractor, report number, date, sponsor, contract number, AD number, IRIA number (when applicable), and security classification. If the document relates to a missile firing, a Missile Résumé worksheet is prepared. The résumé is a compilation of available data obtained from measurements on a ballistic missile during a test flight. It is indexed by individual missile.

3. The Accessions Information Form and Missile Résumé worksheet are then sent to the Computation Department for keypunching. Figure 2 illustrates the processing initiated by the Accessions Information Form. Two types of cards are punched from the Missile Résumé worksheet: a master card that identifies the missile firing, and detail cards that carry the firing date. (See Figure 3 for flow chart of Missile Résumé processing.)

4. The document is then reviewed by a technical staff member who prepares an abstract (see Appendix B-2 for abstract form) and indexes it with subject terms from the

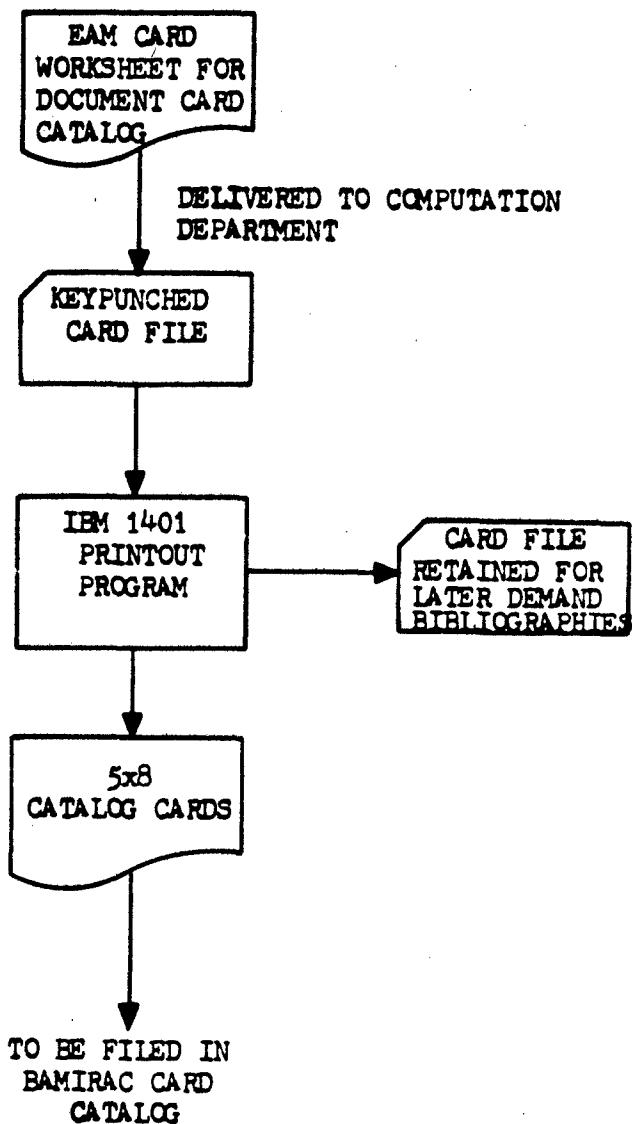


FIGURE 2

BAMIRAC Card Catalog Processing

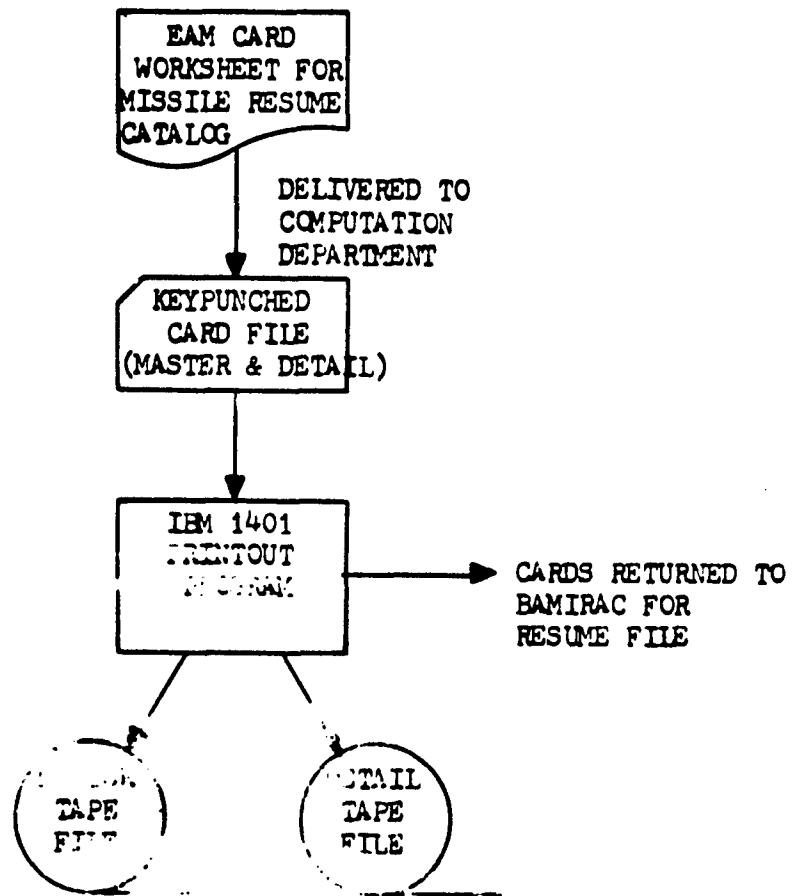


FIGURE 3

BAMIRAC Missile Résumé Processing

BAMIRAC keyword list form (see Appendix B-3). The

keyword list form is also used as a worksheet for later

keypunching of the EAM cards used for searches.

5. If the document does not relate to a missile firing,

but it does contain data in the form of tables or curves, these

data are keypunched on EAM cards for the Data File. In

the case of curves, a special analog-to-digital device is utilized

which automatically keypunches the value of a particular point

on the curve to which its sensor is manually directed.

6. The abstracts are manually filed by accession

(BAMIRAC) number. The keyword list form is kept for

keypunching. The punched cards are filed in the Keyword

File for later machine retrospective searches. The docu-

ments are shelved manually, by BAMIRAC number.

Rejects are made available to the staff or are destroyed.

(2) Outputs

Demand bibliographies are produced by the generalized

machine retrieval program if more than about 30 citations are

involved. This is done by sorting the Keyword File for the

desired terms and then printing out the corresponding accession

numbers using the computer.

If less than 30 citations are involved, the bibliographic information is located instead in the manual card catalog, and the bibliography is completed as a manual operation. Appendix B-4 illustrates a catalog card.

In addition, the Missile Résumé File is printed out by the computer on demand.

Figure 4 depicts the overall BAMIRAC information retrieval system.

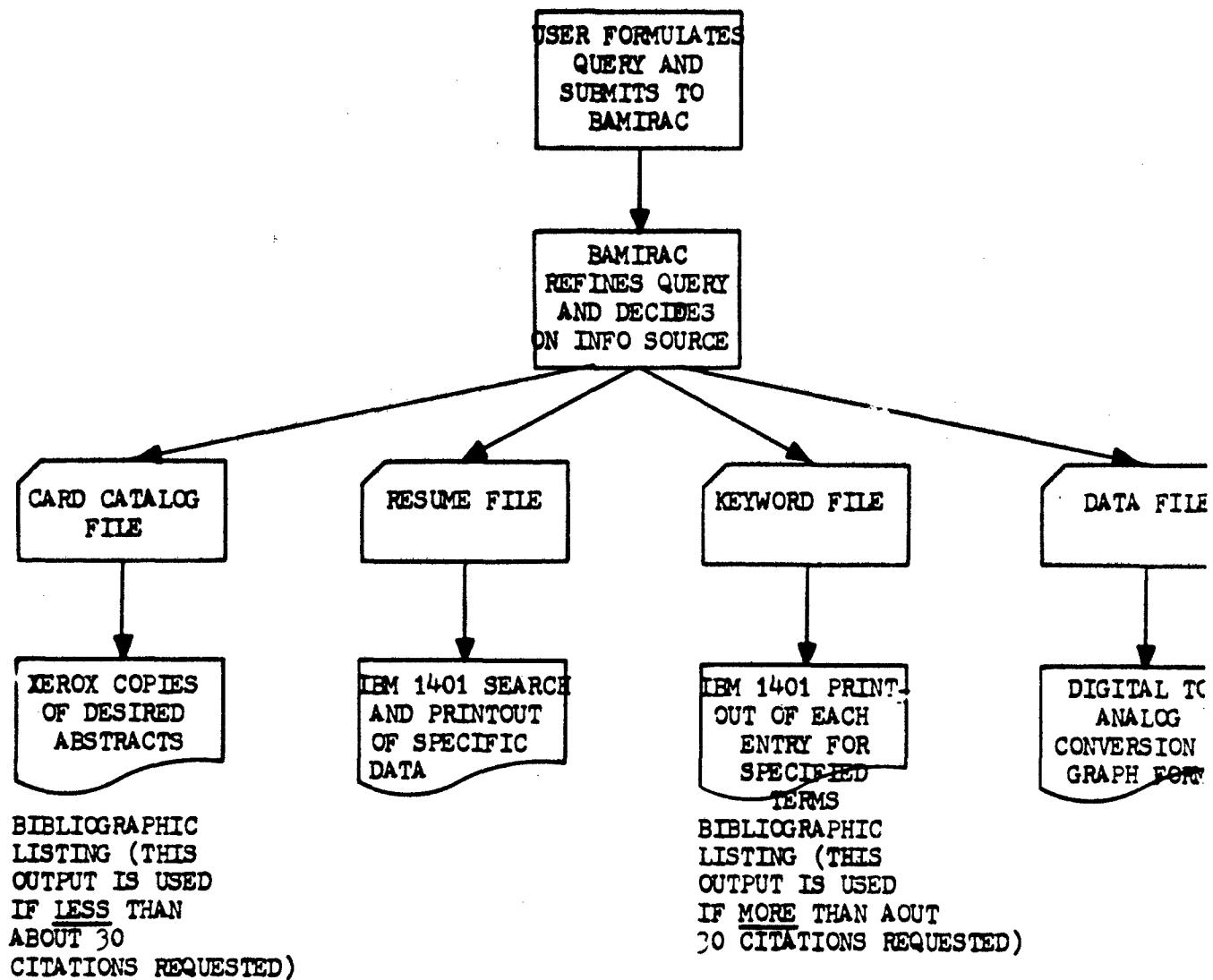


FIGURE 4
BAMIRAC Information Retrieval System

III. PROGRAM SYSTEM DATA

III. PROGRAM SYSTEM DATA

The generalized information retrieval program for the three centers is described in the document Information Retrieval at the Institute of Science and Technology (36943-68-T), dated October 1965 and issued by the Computation Department of the Willow Run Laboratories, Institute of Science and Technology, University of Michigan. A copy of this document is shown in Appendix C. Examples of file structures are given in Appendix D. Instructions for file updating runs are given in Appendix E, and annotated bibliography and index runs are discussed in Appendix F.

IV. EQUIPMENT, COSTS, AND EVALUATIONS

IV. EQUIPMENT, COSTS, AND EVALUATIONS

1. EQUIPMENT

IBM 1401 Computer

Central Processor with 4,000 character core storage

high-speed printer (600 lines per minute)

3 tape drives

2 disk pack drives

Programs are in Symbolic Programming System (SPS)

language or AUTOCODER

The 1401 computer is also used as peripheral equipment to
the Computation Department's IBM 7090 computer.

2. COSTS AND TIME

(1) IRIA

The conversion of the system to mechanization was accomplished
in one year. A man from the Computation Department was assigned
to work on the project for the year. The total computer cost from
July 1963 to July 1964, including the time of the Computation
Department personnel, was \$27,000.

This encompassed card punching, file updating, retrieval, and an effort to machine-produce a cumulative, 10-year holdings list for FY 65.

The total budgeted for computer operation of IRIA in FY 1966 is \$13,000. This includes the IBM 1401 operations but excludes the keypunching activity of the IRIA staff. It is estimated that one keypunch operator at \$3 per hour, spending 75% of her time at keypunching, can do 90% of the keypunching required. The cost of running two tapes to update the file is \$50 every three months. Efficiency of activity, rather than cost reduction, was important in mechanizing the files; IRIA anticipated and received an increase in actual cost.

(2) VESIAC

It is estimated that approximately \$250,000 will be required over a period of 18 months for developing and testing the system and keypunching records for 12,000 documents for the collection. Four VESIAC personnel will be involved, in addition to Computation Department personnel, but no estimate of man-hours is available.

(3) BAMIRAC

The BAMIRAC Information retrieval systems are still in a state of developing and haven't as yet matured sufficiently to accurately estimate the total cost.

3. FACILITIES' EVALUATIONS of SYSTEM

IRIA personnel consider that the operation of their center has been improved by mechanization. Last year, with mechanization, they were able to answer five times as many requests as before. Before going on full-time computer use, IRIA personnel required two to three days to prepare a bibliography for a visitor. The time now required averages one and one-half hours, and bibliographies have been produced in as short a time as 45 minutes.

The increase in response time is primarily due to the mechanized retrieval process which, while not reducing costs relative to the original manual system, is giving a comparable level of performance more cheaply than an equivalent manual system.

The development of a generalized retrieval program for all of the centers has eliminated the need for the more costly process of maintaining a specialized program for each center. Because of center similarities,

this general program fits each center's requirements without significant difficulty. Minor problems were identified in the area of input and output format, but these are being relieved with the development of a standard format and as the centers are assuming control over the EAM card files.

Experience has indicated better system performance when control of the EAM punched cards is maintained within a center. This has the double effect of reducing errors, especially those due to misunderstanding, and of giving a center's staff a better understanding of some of the mechanical problems of the mechanized process.

As ways of reducing response time to user's questions, the opinion has been expressed that electrical connection (such as teletype) to major remote users, as well as machine access to DDC's and selected other computer bases, would be highly significant. The latter arrangement would also help to insure that a center was getting the maximum of available items of interest, as well as simplifying the process of obtaining related material. It was further suggested that a DoD contractual requirement to route pertinent contractor reports to a center would be very helpful.

Users have objected to the difficulty in reading the computer printout of one center. This problem has been somewhat alleviated by darkening each title line by overprinting.

In order to economize on computer printing time, one center has applied the CODEN system to abbreviate journal names and corporate authors. (The CODEN system is discussed in CODEN for Periodical Titles, 1963, ASTM STP 329, American Society for Testing Materials.)

V. BIBLIOGRAPHY

BIBLIOGRAPHY

1. CODEN for Periodical Titles, 1963, ASTM STP 329, American Society for Testing Metals.
2. Information Retrieval at the Institute of Science and Technology, by F. L. Laustein, W. A. Wheaton, W. C. Johnson, D. B. Kirk, University of Michigan Willow Run Laboratories, Computation Department, Document No. 36943-68-T, October, 1965.

APPENDIX A

IRIA DOCUMENTS PROCESSING

INSTRUCTIONS FOR USING INFORMATION PUNCHING FORMIBM COLUMNSINSTRUCTIONS

1 - 23 Inclusive

Leave blank. To be filled out at a later date by reviewers.

24 - 27 Inclusive
(Contractor Code)

Insert four letter code name for contractor writing the report. (Use list of contractor codes, new words to be added as needed.)

Examples: Baird Atomic, Inc. - BASS
Univ. of Michigan - MICH28 - 32 Inclusive
(Contract Number)

Insert last group of digits of the contract number. If only four (4) numerals or less comprise the last group, insert zeros (0) in front of last, the group to bring total up to five (5) digits.

Examples: DA-44-012-sc-17892 becomes 17892
NOas 321-ord-6345 becomes 0634533
(Contracting Dept.)

Insert branch of government or private industry or university having prime interest for funding of the project.

Code:

- 0 Other Gov't. (e.g., AEC, Dept. of State, Dept. of Commerce)
- 1 Dept. of Army
- 2 Dept. of Navy
- 3 Dept. of Air Force
- 4 Private Industry or University
- 5 Foreign

34 - 37 Inclusive
(Sponsoring Agency)

Insert the code name for the government agency, technical service, branch, or major laboratory having prime cognizance over the project. (Use code names)

Examples: Engineer Research and Development Lab.
ERDI
Wright Air Development Division
WADC

A-1
(Continued)

38 - 40 Inclusive
(Publication Date)

Insert month and year of publication. If only a report period is given, insert the termination a period ending date, (Note X-Nov., P-Dec.)

Examples: 21 March 1952 becomes 352

Sept. 1951 becomes 951

Nov. 1949 becomes X49

Dec. 1954 becomes P54

Period 1 July 1953 - 1 October 1953, becomes 053

41 - 44 Inclusive
(Journal Reference) Insert code work for journal in which report appears.
Example: Journal of the Optical Society of America JOSA

45 - 48 Inclusive
(First Author)

Insert initial of first name and the first three initials of the last name.

Examples: Bruce H. Billings BBIL

George A. Morton GMOR

G.B.B.M. Sutherland GSUT

49 - 61 Inclusive
(Abstract NO.)

Insert the letters and numerals of the abstract serial number, being certain to punch all nine (9) spaces. If less than (3) letters appear, insert (X) in front of serial letters, and if less than six (6) numerals appear insert zeros (0) in front of the numerals in order to be sure nine (9) spaces are used.

Examples: TIPC41524

ATI836912

XAD002478

S54003956

62
(Language Code)

Insert one of the following codes if the document is written in a language other than English.
(If in English, leave this column blank).

CODE:

1 German
2 French
3 Russian

4 Italian
5 Spanish
6 Other

A-1
(Continued)

63 - 68 Inclusive
(IRIA Serial No.) Insert the IRIA Serial Number which serves as a means of identifying the card, document, and information punching forms. Insert zeros (0) if less than six (6) numerals appear in the serial number.
Examples: 12846
 00139

69 - 75 Inclusive
(BAMIRAC Serial No.) Insert the BAMIRAC Serial Number which serves as a means of identifying the card, document, as a BAMIRAC document, cross referenced to IRIA. Use B for the first column of the code then use six (6) numerals, forming a code of 7 columns. Zeros are inserted if less than 6 numerals appear in the serial number.
Examples: B123789
 B002657

76 - 79 Inclusive These columns are to be left blank for the present.
(Reserved)

80 Insert one of the following codes according to
(Security Designation) the classification of the report.

CODE :

1. Unclassified (and open literature)
2. Confidential — Modified Handling Authorized
3. Confidential
4. Secret
5. Top Secret

NOTE: Not all items will be filled in on all cards. Hence, blank columns should be left where items do not apply. However, caution must be exercised in using the proper number of digits for each code, inserting zeros (0) and/or "X" in front of a group in order to build up to the proper total of each item.

ANALYSIS FORM

TRACTOR Code AJETTRACT Number 01461PARTMENT Service Code 1INSORING Agency ACRDDate of Publication 260JOURNAL -----Author Code CLENAuthor Code -----TRACT Number -----Language Code -----Serial Code 007129SERVE -----PRIORITY Code YCLERKS Initials G.H.H: PPCATEGORY WORDS GMSL - REENEVALUATION CODE 3TYPE OF REPORT YCategory Number -----Category Number 9.2.0CATEGORY NUMBER 9.2.5VIEWERS Initials J.P.L

9.2.5

FRONT

A summary report on
the radiometric and
spectrographic measurements
of Atlas missiles during
re-entry. Test procedures
and results are presented

Here

S.J.

3.2.5

BACK

Sample Contract File Cards

CONTRACTOR - Wheeler Aircraft Corporation

CONTRACT NOS. - AF 15(840)-3906 DA 99-078-ord-4567
AF 17(963)-4360

CONTRACT NO. - AF 15(840)-3906

CONTRACTOR - Wheeler Aircraft Corporation

SPONSOR - Air Research and Development Command

TYPE OF WORK - Research and development on special aircraft

AUTOMATIC DISTRIBUTION

IRIA Number List

8654
8892
9012
9214
9654

INSTRUCTIONS TO REVIEWERS FOR FILLING OUT "INFORMATION PUNCHING FORMS"

EM COLUMNS

INSTRUCTIONS

1 - 12

Note: Prior to filling in Columns 1 - 12 (Category Word Codes), it is recommended that items 14 - 23 (Category Numbers) be inserted.

Insert several "category words" not found under the numerical listing of Category Numbers, which describe the content of the report; not exceeding three (3) words. The words should be coded into four (4) letter codes and entered on the form in the space provided. If the numerical listing is adequate, this section may be left blank. See IRLA Word Codes.

13

(Evaluation Code)

Insert a code number indicating your opinion of the value of this report or paper being reviewed. This evaluation code does not refer to the quality of report writing but rather the value of the report to an infrared researcher. For example, a report on a new detector with increased sensitivity might be "must" reading for someone interested in detectors even though it is poorly written. Most of the reports will fall in the #3 code. Strive to be as unbiased as possible bearing in mind the purpose of the document is to serve someone else's needs. Also bear in mind that many users of the IRLA system will request only code #1 and #2 reports expecting that these reports will present new information.

CODE:

1 Excellent — A new and very noteworthy contribution. (Must reading for all researchers in the field.)

2 Very Good — (A report showing marked progress in the field, but not necessarily of interest to many researchers.)

3 Average — A good report depicting some progress. (A large percentage of reports fall into this category.)

4 Fair — A report that depicts some progress but is very limited in value. (May well be omitted by many researchers, except in special cases.)

5 Poor — A report presenting nothing new, being of little or no scientific value. (A waste of time for most researchers.)

100-1000

A-4
(Continued)

14 (Type of Report)

Insert a code number (only one number) indicating the predominant classification of the report. Reports may fall into more than one classification type. If four (4) or more types are applicable, the "Omnibus" or "Code 8" should be used.

CODE:

- 1 - Military-sponsored "system" or staff study.
- 2 - General survey and/or summary of literature.
- 3 - Largely a Theoretical Analysis.
- 4 - Largely Laboratory experimental work.
- 5 - Prototype design and construction.
- 6 - Operational tests of equipment or operations analysis and research.
- 7 - Largely an administrative report.
- 8 - Omnibus, reports covering four or more of the above areas.
- 9 - Technical Manuals, Manuals of Operation; handbooks.
- 10 - Experimental-Theoretical Work.
- 11 - Intelligence Reports.

15 - 17
(3rd category No.)

Insert the category number of tertiary interest (if any) in accordance with the section numbers appearing in the infrared Bibliography Outline. (e.g., 912 - Scanners).

18 - 20
(2nd category No.)

Insert the category number of secondary interest in the same manner as prescribed above. (e.g., 52 - Quantum Detectors).

21 - 23
(1st category No.)

Insert the category number of primary interest. (e.g., 21 - Thermal Sources).

A-4
(Continued)

Report Type Code Numbers

1. Military Sponsored System or Staff Study

Category includes a general evaluation of techniques, methods, and doctrine such as study of near infrared for ground combat or infrared techniques for reconnaissance systems.

2. General Survey or Summary of Literature

Bibliographies, extensive reference lists, etc., as well as report such as the "Peoples Report" should be included in this type.

3. Largely a Theoretical Analysis

This type of report may be exclusively theory, but also includes reports in which the theory dominates the experimental work.

4. Largely Laboratory Experimental Work

This type of report includes test data, description of test procedure possibly equipment and results. It may include some theory where the theory supports the experiment rather than vice versa.

5. Prototype Design and Construction

This type of report describes the details of equipment particularly from the hardware standpoint rather than design fundamentals.

6. Operational Tests of Equipment or Operations Analysis and Research

This type of report includes "user tests" subsystem design and test field tests, etc.

A-4
(Continued)

7. Largey and Administrative Report

1.0.0
1..

This type of report usually tells what is being done and how far they have proceeded rather than reporting the actual details.

8. Omnibus

1.4
1.7
2.0.0

For reports covering four or more areas.

9. Instruction Manuals

2.1
2.2
2.3
2.4
2.5
2.6

Handbooks

10. Experimental-Theoretical Work

2.7
2.8
2.9
3.0.0
3.1

For reports where neither theory nor experiment dominate; where they are completely complementary.

11. Intelligence Reports

For reports which include information gathered from other Nations through intelligence channels.

3.2

3.3
3.4

4.0.0

4.1
4.2
4.3
4.4
4.5

4.6

DICTIONARY OF IRIA CATEGORY NUMBERS

| | | |
|-------------------|--|--|
| ntal Physical | 5.0.0 Detection Materials & Elements | 7.5.4 Aldehydes 7.5.5 Acids 7.5.6 Others |
| of Materials | 5.1.0 Thermal Detectors 5.1.1 Bolometers 5.1.2 Thermocouples & Thermopiles 5.1.3 Expansion 5.1.4 Dielectric 5.1.5 Evaporation or Conduction 5.1.6 Absorption Edge 5.1.7 Luminescent | 7.6.0 H-C-N Compounds 7.6.1 Aliphatic Amines 7.6.2 Heterocyclics 7.6.3 Others |
| formation | 5.2.0 Quantum Detectors 5.2.1 Photoemissive 5.2.2 Photoconductive 5.2.3 Photovoltaic 5.2.4 Luminescent 5.2.5 Image Tubes 5.2.6 Photoelectromagnetic | 7.7.0 H-C-O-N Compounds 7.7.1 Amides 7.7.2 Others |
| ng | 5.3.0 Photographic 5.4.0 Optical Pumps 5.5.0 Microwave Techniques | 7.8.0 Plastics 7.9.0 Fluorocarbons |
| State | 6.0.0 Laboratory Components & Techniques | 7.11.0 Silicones |
| ious | 6.1.0 Optical Components 6.1.1 Prisms 6.1.2 Filters and Windows 6.1.3 Mirrors 6.1.4 Lenses 6.1.5 Gratings | 8.0.0 Infrared in Science |
| phies | 6.2.0 Optical Equipment 6.2.1 Spectrometers 6.2.2 Monochromators 6.2.3 Interferometers 6.2.4 Polarizers 6.2.5 Radiometers | 8.1.0 Astronomy and Geophysics 8.2.0 Physics 8.3.0 Chemistry 8.4.0 Meteorology |
| escence | 6.3.0 Electrical Equipment 6.3.1 Simulators | 9.0.0 Military Technology |
| ence | 6.4.0 Electrical Components 6.4.1 Amplifiers 6.4.2 Displays 6.4.3 Servo Systems | 9.1.0 Auxiliary Components |
| 5 | 6.4.4 Modulation Systems 6.4.5 Electronics & Electric Filters | 9.1.1 Irdomes 9.1.2 Scanners 9.1.3 Data Processing 9.1.4 Display 9.1.5 Circuitry 9.1.6 Optics 9.1.7 Reticles 9.1.8 Coolers |
| Beam | 7.0.0 Infrared Spectra | 9.2.0 Systems |
| 1 | 7.1.0 General 7.2.0 Elements 7.3.0 Inorganic | 9.2.1 Reconnaissance 9.2.2 Recognition & Detection, Mapping 9.2.3 Navigation 9.2.4 Search and Warning 9.2.5 Communication 9.2.6 Trucking & Fire Control 9.2.7 Homing 9.2.8 Bombing 9.2.9 Ranging |
| large | 7.4.0 H-C Compounds 7.4.1 Aliphatics 7.4.2 Aromatics | 9.3.0 Aerial Countermeasures 9.3.1 Active 9.3.2 Passive |
| & | 7.5.0 H-C-O Compounds 7.5.1 Alcohols 7.5.2 Esters 7.5.3 Ketones | 9.4.0 Ground-Based Countermeasures 9.4.1 Active 9.4.2 Passive |
| ision | 7.6.0 H-C-N Compounds 7.6.1 Aliphatic Amines 7.6.2 Heterocyclics 7.6.3 Others | 9.5.0 Detection of Gases & Vapors |
| ackgrounds | 7.7.0 H-C-O-N Compounds 7.7.1 Amides 7.7.2 Others | 10.0.0 Infrared in Arts, Medicine & Industry |
| n | 7.8.0 Plastics 7.9.0 Fluorocarbons | 10.1.0 Graphic |
| ounds seen | 7.11.0 Silicones | 10.2.0 Criminology & guerrilla activities |
| atellite altitude | 8.0.0 Infrared in Science | 10.3.0 Plant Protection |
| de" targets | 8.1.0 Astronomy and Geophysics | 10.4.0 Miscellaneous Industrial Uses |
| ig | 8.2.0 Physics | 10.5.0 Agriculture |
| inel | 8.3.0 Chemistry | 10.6.0 Food Industry |
| e Vehicles | 8.4.0 Meteorology | 10.7.0 Medicine |
| ft | 9.0.0 Military Technology | 10.8.0 Transportation |
| es | 9.1.0 Auxiliary Components | |
| Surface | 9.1.1 Irdomes | |
| es | 9.1.2 Scanners | |
| Vehicles | 9.1.3 Data Processing | |
| re | 9.1.4 Display | |
| ic Bodies | 9.1.5 Circuitry | |
| 5 | 9.1.6 Optics | |
| erties | 9.1.7 Reticles | |
| theory | 9.1.8 Coolers | |
| 1 Solids | 9.2.0 Systems | |
| s | 9.2.1 Reconnaissance | |
| ls | 9.2.2 Recognition & Detection, Mapping | |
| cts | 9.2.3 Navigation | |
| s | 9.2.4 Search and Warning | |
| .ons | 9.2.5 Communication | |
| | 9.2.6 Trucking & Fire Control | |
| | 9.2.7 Homing | |
| | 9.2.8 Bombing | |
| | 9.2.9 Ranging | |
| | 9.3.0 Aerial Countermeasures | |
| | 9.3.1 Active | |
| | 9.3.2 Passive | |
| | 9.4.0 Ground-Based Countermeasures | |
| | 9.4.1 Active | |
| | 9.4.2 Passive | |
| | 9.5.0 Detection of Gases & Vapors | |
| | 10.0.0 Infrared in Arts, Medicine & Industry | |
| | 10.1.0 Graphic | |
| | 10.2.0 Criminology & guerrilla activities | |
| | 10.3.0 Plant Protection | |
| | 10.4.0 Miscellaneous Industrial Uses | |
| | 10.5.0 Agriculture | |
| | 10.6.0 Food Industry | |
| | 10.7.0 Medicine | |
| | 10.8.0 Transportation | |

DICTIONARY OF CODE WORDSA

ABER Aberration - to discuss the theory and phenomena in various optical systems. See also KELS, MAKS, RATR, ASPH.

AESP Absorption - for substances other than the atmosphere, CO_2 , H_2O , Ozone when absorption is discussed. See also EMSN.

ACTV Active - for systems which include their own source, e.g. the sniperscope. See also BINC, DRVG.

ADPX Ammonium dihydrogen phosphate.

AERH Aerodynamic Heating

AGCL Silver Chloride - See also ASTS.

ALNI Aluminum Nickel.

ALOO Alumina

ALZZ Aluminum.

AMMO Amplitude Modulation.

AMPL Amplifier - light, electronic, magnetic, etc.

ARTC Arctic - for tests on equipment, measurements and operations in this region.

ASPH Aspheric - to describe optical surfaces. See also ASPH, KELS, MAKS, RATR.

ASTS Arsenic Trisulfide - See also ACCL, GLAS.

ATAR Air-to-Air - for all equipments which have this function (they may be test gear, and they may also be air-to-ground as well). Ground includes the ocean for these purposes. See also ATGD.

ATGD Air-to-Ground - see definition air-to-air.

ATMO Atmosphere

ATTD Altitude, Position.

Sample IRIA Punch Cards

SAMPLE IRIA DEMAND BIBLIOGRAPHY

B00021
ZISSIS, G. LAROCCA, A. HALL, F.J.
LIVISAY, J. MORGAN, J.
INFRARED MEASUREMENTS OF BALLISTIC MISSILES DURING IRMP
1958 (SECRET)
UNIVERSITY OF MICHIGAN
2900 10-T JUNE 1959
ARMY SIGNAL CORPS DA-36-039-SC-52654

AD 152 442
R00046
FLÄMMER, C.
BACK-SCATTERING CROSS SECTIONS OF MISSILE TRAILS, THE
(UNCLASSIFIED)
STANFORD RESEARCH INSTITUTE
TR-64, AFCRC-TN-58-190. JUNE 1958
AIR FORCE CAMBRIDGE RES. CENTER AF 19(604)03458

800113 AD 160 756
ESTOQUE, M.
VENTING OF HOT GASES THROUGH TEMPERATURE INVERSIONS
(UNCLASSIFIED)
GEOPHYSICS RESEARCH DIRECTORATE
AFCRC-TN-58-623 GRD RESEARCH NOTE NO. 3 DEC. 1958
AIR FORCE CAMBRIDGE RES. CFNTER IN - HOUSE

BC0133 AD 302 207
STUDY OF RADAR BEAM ATTENUATION IN ROCKET EXHAUST GASES
(CONFIDENTIAL)
STANFORD RESEARCH INSTITUTE
QUARTERLY STATUS REPORT 3 MAY 1957
AIR RF SEARCH AND DFV. COMMAND AF 04(645)00066

800188 AD 114 176
KELLOGG, W. PASSMAN, S.
INFRARED TECHNIQUES APPLIED TO THE DETECTION AND
INTERCEPTION OF INTERCONTINENTAL BALLISTIC MISSILES
(SFCRET)
RAND CORPORATION
RM-1572 OCT. 1955

APPENDIX B

BAMIRAC DOCUMENTS PROCESSING

B-1
ACCESSIONS INFORMATION FORM

BAMIRAC NO. _____

AUTHOR (S) _____

TITLE IN FULL _____

CONTRACTOR _____

REPORT NO. OR VOLUME NO. _____

DATE OF PUBLICATION _____

SPONSOR (S) _____

CONTRACT NO. (S) _____

AD or ATI NO. _____

IRIA NO. _____

SECURITY CLASSIFICATION _____

MISC. INFORMATION _____

B-2

BAMIRAC RADIATION DATA LIBRARY

Abstract

REVIEWER _____

BAMIRAC NUMBER _____

DATE OF REVIEW _____

**SECURITY CLASSIFICATION
OF THE ABSTRACT** _____

EVALUATION CODE _____

ABSTRACT:

BAMIRAC KEY WORD LIST

| <u>1. TYPE OR REPORT</u> | <u>10. PHASE</u> | <u>20. GENERAL SUBJECT</u> | <u>30. AREA</u> | <u>40. MODIFIER</u> |
|--------------------------|------------------|----------------------------|-----------------|---------------------|
| 0 REVIEW | 0 LAUNCH | 0 VEHICLE CHAR. | 0 ULTRAVIOLET | 0 SPECIES |
| 1 THEORETICAL | 1 MIDCOURSE | 1 RESUME DATA | 1 VISIBLE | 1 SOLID MATERIALS |
| 2 LABORATORY | 2 REENTRY | 2 ATMOSPHERE | 2 INFRARED | 2 PROCESSES |
| 3 FIELD | | 3 ABM, PEN. AIDS | 3 ENVIRONS | 3 THERMODYNAMICS |
| 4 PROGRESS | | 4 INSTRUMENTATION | 4 WAKE | 4 BODY DYNAMICS |
| 5 TEST | | 5 RADAR | 5 DECOY | 5 SPECTRAL RESOL. |
| 6 SYMPOSIUM | | 6 FLUID DYNAMICS | | 6 SPATIAL RESOL. |
| 7 SPECS | | 7 ENERGY TRANSFER | | 7 GROUND-BASED |
| 8 BIBLIOGRAPHY | | 8 CHEMISTRY | | 8 AIRBORNE |
| 9 SYSTEMS | | 9 PHYSICS | | |

RARE TERMS

| | |
|--------------|--|
| PROJECT NAME | |
| BOOSTER | |
| NOSE CONE | |
| DECOY | |
| OTHER | |

DOCUMENT IDENTIFICATION

| | |
|-------------------------------|---------|
| PUB. DATE (e.g. 9 63) | MO. YR. |
| CORP. AUTHOR (Leave blank) | |
| BAMIRAC NUMBER | |

B-4

B 9450

FLIGHT EVALUATION REPORT FOR WAC-2 RE-ENTRY VEHICLE #70
ATLAS F MISSILE NO. 137 AMR TEST 575 (SECRET)

GENERAL ELECTRIC COMPANY, RSC
PHILADELPHIA, PENNSYLVANIA

REPORT 64SC5C44

PALLISTIC SYSTEMS DIVISION

SEPT. 1964

AF 04(694)00350

Sample 5x8 Catalog Card

APPENDIX C

**GENERALIZED INFORMATION RETRIEVAL
PROGRAM FOR THE THREE CENTERS**

36943-68-T

INFORMATION RETRIEVAL AT THE INSTITUTE OF SCIENCE AND TECHNOLOGY

F. L. LAUNSTEIN
W. A. WHEATON
W. C. JOHNSON
D. B. KIRK

October 1965

Computation Department
Willow Run Laboratories
THE INSTITUTE OF SCIENCE AND TECHNOLOGY
THE UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

WILLOW RUN LABORATORIES

ACKNOWLEDGMENTS

Acknowledgment must be made to Mr. D. M. Sinnett, currently with the Detroit Memorial Hospital, who assisted in the preparation of many of the subroutines used in this program.

WILLOW RUN LABORATORIES

ABSTRACT

Information Retrieval at a particular computing installation is a function of need, cost, and machine availability. Small machines not designed primarily for mathematical calculations can, however, effectively perform the basic operations required by a retrieval system, namely, the selection, arrangement, and printing of data. A system has been designed at The University of Michigan in which the retrieval request provides complete specifications for each of the above topics, and thus permits a variety of outputs to be prepared without the intervention of programmers and specialized programming. Although the system is described in general terms, it has been programmed for an IBM 1401 and is operating quite successfully. A complete description of the methods of preparation and retrieval of data is presented, including an illustrative example.

WILLOW RUN LABORATORIES

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| | |
|---|-----|
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| Abstract | iii |
| 1. Introduction | 1 |
| 2. Preparation | 1 |
| 2.1. Preparation of the Detail Punch Cards from a Basic Source Document | 1 |
| 2.2. Preparation of a Tape from the Cards | 2 |
| 3. Retrieval | 3 |
| 3.1. The Selection of Information from the Tape | 3 |
| 3.1.1. The SRCH Card | 5 |
| 3.2. The Arrangement of this Information in Some Order | 6 |
| 3.2.1. The SORT Card | 6 |
| 3.2.2. The ALSO Card | 6 |
| 3.3. Printing the Retrieved Information | 7 |
| 3.3.1. The PRNT Card | 7 |
| 3.3.2. The HEAD Card | 7 |
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WILLOW RUN LABORATORIES

INFORMATION RETRIEVAL AT THE INSTITUTE OF SCIENCE AND TECHNOLOGY

1 INTRODUCTION

Information retrieval as a data-processing function, using high-speed computers, has received much attention during the last few years. Many different techniques have been developed for storing, searching, sorting, and printing information. In fact, there are probably as many different programs to perform a particular retrieval function as there are different computing installations in the country. Items such as need, cost, the type of machine available for use, and the ultimate value of the output, all determine the type of retrieval system developed. Ours evolved from the needs of our libraries at IST.

The system developed at the Willow Run Laboratories of The University of Michigan's Institute of Science and Technology is described in general terms and is, therefore, machine independent. It has, however, been programmed for an IBM 1401 and is satisfactorily fulfilling our requirements. In describing the system, references to specific card formats may be made in order to clarify how some fundamental parameters are read by the program. A simple example, illustrating the features of the system, and showing how these parameters are used, is included at the end of the report.

Any information retrieval system must contain a provision for storing information and recalling it in some manner. The system used here is designed for retrieving information from magnetic tape that has been prepared from punch cards. An outline of the system can be separated into the categories listed below (with the section number in which each is discussed):

- 2. Preparation
 - 2.1. Preparation of the detail punch cards from a basic source document
 - 2.2. Preparation of a tape from the cards
- 3. Retrieval
 - 3.1. Selection of information from the tape
 - 3.2. Arrangement of this information in some order
 - 3.3. Printing the retrieved information
- 4. File Maintenance

Each of these categories will be fully discussed in the following pages.

2

PREPARATION

2.1. PREPARATION OF THE DETAIL PUNCH CARDS FROM A BASIC SOURCE DOCUMENT

The creation of the cards from a basic source document is the most important phase of the entire system. If a new library is being established, close collaboration with someone familiar with the information retrieval system should be maintained in order to minimize subsequent data

WILLOW RUN LABORATORIES

processing problems. What information is required and the number of locations that are to be allocated to the data must be specified. A fundamental unit or "case" must be defined so that one unit may be distinguished from another. Each unit, or even individual subunits, may require more than one punch card. Basic definitions must be made to identify the information in the cards:

- (A) A "case" or unit code.
- (B) A card code to identify the information in specific fields within that detail card.
- (C) A provision for more than one detail card (continuation cards) for a particular card code. Continuation cards are commonly encountered when punching titles or abstracts from the document.

It is important to include all relevant information for the requirements of the user. Too often, however, additional data are included merely because they "might be useful." Such additions will result in greater expense, both in data handling and in machine usage. On the other hand, the omission of a piece of data, or lack of specification may cause substantial re-punching or reprogramming. Careful planning is extremely important before the cards are prepared. The trite statement that the output will be no better than the input still holds.

2.2. PREPARATION OF A TAPE FROM THE CARDS

The transition from cards to tape is accomplished by means of a File Conversion Program. Control cards which provide a numerical identification of the information on the detail cards are first prepared. The conversion program, followed by the control cards and detail cards, then prepares the tape on which the information is stored. Field codes are assigned to each category of interest which appears on the detail cards. A separate record will be prepared for each "case." Four types of control cards that will provide identification of the information on the detail cards are:

- (A) Identification Card, containing
 1. The date of tape preparation
 2. Identification for checking purposes
- (B) Group Control Identification, containing
 1. Starting position of "case" field on the detail cards
 2. Length of "case" field
 3. Starting position of card type field on the detail cards
 4. Length of card type field

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(C) Field Description Cards (one for each field), containing

1. Card type code on the detail cards
2. A field code number to be assigned
3. Starting position of the field on the detail card
4. Length of the field
5. An indication of whether continuation cards are permitted for this field

(D) A card to signal the end of the control group

The number of the tape, date prepared, samples of the card input, lists of field codes used, and the items defined by the field codes should be kept by the user for reference purposes.

3

RETRIEVAL

3.1. THE SELECTION OF INFORMATION FROM THE TAPE

Many techniques can be devised for extracting information from the data tape. The technique finally used was decided upon after substantial experimentation and numerous trial runs. A decision is made whether or not to select the entire record (unit) based upon a combination of one or more request factors, involving logical AND, OR search conditions. If the record is selected, it is copied onto another tape in its present form; if not, the record is simply bypassed on the search run.

The specifications for selecting records are made up from the following five items:

- (A) Field code or codes in the record
- (B) Logical operations of "AND," "OR," "NOT"
- (C) A comparison of "GREATER THAN," "EQUAL TO," or "LESS THAN"
- (D) An argument associated with a particular field code
- (E) A signal to indicate the termination of the request

In addition, provisions are available for searching an entire field, character by character, or in blocks, if desired. The symbol definitions are as follows:

| <u>Symbol</u> | <u>Definition</u> |
|---------------|--|
| A | Logical AND |
| o (letter) | Logical OR |
| N | NOT |
| M | Symbol for search by blocks in a particular field. (Total field must be an integral multiple of the block size.) |

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| <u>Symbol</u> | <u>Definition</u> |
|---------------|---|
| S | Symbol for character string search throughout entire field (Argument must be less than or equal to the field size). |
| G | GREATER THAN |
| L | LESS THAN |
| B | NO SUCH FIELD |

In creating search requests, the EQUAL option is always assumed. Various combinations of the operational symbols may be developed. In conjunction with the operation, field code, and comparison symbols, an argument is necessary. Let us assume that a \$ is used to divide the operational symbol(s) and the argument. Then the following request:

Example 1:

Field Code and Argument

\$05\$123\$

might imply: Select all records that have 123 in field code 05.

Example 2:

\$05\$123\$

\$014\$456\$

might request: Select all records with 123 in field code 05 OR 456 in field code 14.

Example 3:

\$05\$123\$

\$AN13L\$45\$

\$AS12\$_DOG_\$ (where _ represents a blank column on the request card)

might request: Select all records that have (1) 123 in field code 05 (2) AND NOT those with field code 13 LESS than 45, (3) AND those with _DOG_ any place in field code 12. Thus, a case with 123 in field code 05, 50 in field code 13, and _DOG_ anywhere in field code 12 would be selected: those without _DOG_ in code 12, OR < 44 in code 13, OR without 123 in code 05 would be rejected. If blanks had not been used to separate the argument DOG, a word such as DOG-MATIC would satisfy the third condition.

The operator field, which is made up of operation symbols and a field code, is thus of variable length and is developed from left to right. A table of various combinations and definitions is shown using field code 12 as an example.

WILLOW RUN LABORATORIES

| <u>Operator</u> | <u>Definition</u> |
|-----------------|---|
| 12* | Select records with field code 12 equal to the argument . . . |
| A12 | AND the argument of field code 12 equal to . . . |
| AN12 | AND the argument of field code 12 Not equal to . . . |
| AN12G | AND the argument of field code 12 Not greater than . . . |
| A12L | AND the argument of field code 12 less than . . . |
| A12G | AND the argument of field code 12 greater than . . . |
| A12B | AND field code 12 missing |
| AS12 | AND search the entire field for . . . |
| AM12 | AND block search the entire field for . . . |

(A similar set may be obtained by replacing A with ϕ in the operator and the AND with OR in the definition.)

The general form of the search operator will be:

$(A) (N) (S) (M) FC (G) L$ where the letters FC represent the field code and the letters enclosed by () are optional. A related argument, of course, is also required.

Arguments connected by the OR operator may be thought of as enclosed by parentheses. For example, a request of (W or X) and (Y or Z), will choose the following combinations: (W, Y), (W, Z), (X, Y), or (X, Z). It would be written (symbolically) SW\$eX\$AY\$eZ\$, where W, X, Y, and Z represent field codes and arguments are deleted for simplicity.

A restriction to the program is that G or L may not follow the field code when the operators S or M are used.

Finally, a symbol such as END is needed to signal the end of the cards associated with the search request.

3.1.1 THE SRCH CARD. Cards punched SRCH in column 1-4 and blank in column 5 are the search input to the retrieval program. They govern the selection of the desired records from the data tape. Since the field code-operator symbol field is of variable length (from 2 to 5 characters), and the argument field is also of variable length, the division of these fields is indicated by the \$ delimiter as illustrated in the past examples. Each card will start with a \$ in column 6 and must terminate with a \$ on or before column 72. Since Blank columns are equally as important as non-blanks in the argument field, the request must be carefully prepared. To

*The A or ϕ may be omitted on the first operator, if desired.

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reduce the number of cards required, many request options may be placed on one card. As an illustration, the actual input card for example 3, above, would appear as:

```
SRCH $05$123$AN13L$45$AS12$_DOG_$  
SRCH_END
```

Notice that the field code must precede its related argument. For ease in reading, it is suggested that a complete argument terminate a card.

3.2. THE ARRANGEMENT OF THIS INFORMATION IN SOME ORDER

After the information has been selected, an ordering or sort is then performed. Up to ten field codes may be nested for this operation if desired. Two cards are required for this phase: (1) the SCRT card, indicating how the sort is to be completed, and (2) the ALSO card, indicating what information is to be carried.

3.2.1. THE SORT CARD

| <u>Columns</u> | <u>Contents</u> |
|----------------|--|
| 1-4 | SORT |
| 5 | Blank |
| 6-7 | Primary (or most significant) sort field code |
| 8-9 | (1) Position of first (left-most) character to be sorted |
| 10-11 | Number of characters to be sorted |
| 12-13 | Secondary field code |
| 14-15 | (2) Starting position desired for sort (left-most) |
| 16-17 | Number of characters sorted |

The remainder of the card follows the same pattern (6 characters per field sorted) down to the least significant field.

The first blank after column 11 will terminate the sorting specifications.

3.2.2. THE ALSO CARD. In addition to the fields carried in the SORT card, other fields not involved in the ordering (sometimes the entire record) are usually required for the print-out. This is accomplished by means of the ALSO card. Its specifications are quite simple:

| <u>Columns</u> | <u>Information</u> |
|----------------|---------------------------|
| 1-4 | ALSO |
| 5 | Blank |
| 6-7 | Field code (1) be carried |

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| <u>Columns</u> | <u>Information</u> |
|----------------|-------------------------------|
| 8-9 | Field code (2) to be carried |
| . | |
| . | |
| 70-71 | Field code (33) to be carried |

The first blank following column 5 terminates this request card. This option is most useful when only two or three additional field codes are to be carried. If the entire record is to be selected, the letters ALL should be written in columns 6-8 of the ALSO card.

3.3. PRINTING THE RETRIEVED INFORMATION

The specifications for the final printed output allow the user to specify what information is to be printed, where it is to be printed, and also provide controls for appropriate spacing, which are necessary to provide a legible result. Provisions are made for inserting a heading for the entire job, as well as a heading for each page of output, if that is desired. Parameters related to spacing are also described.

3.3.1. THE PRNT CARD. This is a Print Control Card that defines the right margin of the page, indicates whether the decision to go to a new page is based on a single line or entire record, and governs spacing between records. In addition, 61 spaces are provided for identification of the job being printed. Specifications are

| <u>Columns</u> | <u>Description</u> |
|----------------|---|
| 1-4 | PRNT |
| 5 | Blank |
| 6-8 | Right-hand margin |
| 9 | Is new page based on a <u>line</u> near the bottom of the page? (Y - yes; N - no) |
| 10 | Is new page based on a <u>record</u> near the bottom of the page? (Y - yes; N - no) |
| 11 | What spacing is to <u>follow</u> the printing of the last line of a record? (J - 1 space; K - 2 spaces; 1 - new page; blank - no spacing) |
| 12-72 | Job description |

3.3.2. THE HEAD CARDS. The page heading card(s) will supply information to be printed at the top of each page of the listing. It is identified by the letters HEAD punched in columns 1-4 of every card required. If no heading is desired at the top of each page, no cards with HEAD in columns 1-4 need be prepared, and the control cards will go directly from the SORT control to the LIST control.

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There are fundamentally four pieces of information required for each item, with the exception of descriptive information to be placed in the body of the printout. Except for the identifying letters in columns 1-4, this information is identical to the requirements for printing the body of the report (see LIST below). Nine positions will be required for each field code to be printed:

- (A) The Field Code (2 Columns)
- (B) Print Control (1 Column)
- (C) Left Margin (Optional) (3 Columns)
- (D) Right Margin (Optional) (3 Columns)

(A) Field Code

This is self explanatory for categorized data. If it is desired to print additional descriptive information, the letters XX are to be inserted in the first field code position (6-7) of the card. The remainder of the card from column 15 through \$ (or through column 68) will be interpreted as description.

(B) Print Control

This column governs when to print and what action is to be taken after the information identified by the related field code is processed. The following options are available:

- (blank) - Insert the information.
- / - Insert the information, print, and single space.
- S - Insert the information, print, and double space.
- A - Insert the information, print, and go to a new page.

(C) Left Margin

The numbers (right adjusted) indicate the starting position of this print field, measured from the left margin of the page. If the specification is blank, five spaces will be inserted in the print line. If no left margin is given for the first item on the line, it will be at position 1.

(D) Right Margin

This indicates the right-most margin for printing the particular line. It is governed in all cases by the maximum margin indicated in the PRNT card. If it is blank, the number stated in the PRNT card is used.

The termination of Heading information is indicated by a card punched HEAD in columns 1-4, blank in column 5, and END in column 6-8.

3.3.3. THE LIST CARDS. These cards specify what, where, and how to print the information in the body of a report. The information need be specified for one record only. Additional records are processed in the same way.

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The specifications are identical with the HEAD cards (see above), except that LIST is punched in columns 1-4 of each card instead of HEAD.

Examples of HEAD and LIST Cards

(A) Description Cards (XX in columns 6, 7)

| <u>Column</u> | <u>Information</u> |
|---------------|---|
| 1-4 | HEAD (or LIST) |
| 5 | Blank |
| 6-7 | XX |
| 8 | Print control character |
| 9-11 | Indentation |
| 12-14 | Right margin |
| 15-68 | Any description; terminated by \$ or column 68. |

(B) Normal Field Code Cards

| <u>Column</u> | <u>Information</u> |
|---------------|--------------------|
| 1-4 | HEAD (or LIST) |
| 5 | Blank |
| 6-7 | Field Code |
| 8 | C (Print control) |
| 9-11 | (1) Left Margin |
| 12-14 | Right Margin |
| 15-16 | Field Code |
| 17 | C (Print control) |
| 18-20 | (2) Left Margin |
| 21-23 | Right Margin |
| . | . |
| . | . |
| . | . |
| 60-61 | Field Code |
| 62 | C (Print control) |
| 63-65 | (6) Left Margin |
| 66-68 | Right Margin |

Provision is made in the system for omission of the search, sort, or print phases of the operations. SRCH, SORT, or PRNT control cards with OMIT punched in column 6-9 should be inserted at the proper position in the request.

WILLOW RUN LABORATORIES

4 FILE MAINTENANCE

To maintain an up-to-date file, provisions must be made for additions, deletions, and changes to existing cases. Elaborate procedures might be devised for making changes to a particular field on a particular case. However, the technique developed at IST for updating is simple, straightforward, and direct.

At the time the card identification codes for the original data are set up, a special code to be subsequently used for deletions is defined. A related field code will be assigned to this card type and will be kept with the field description cards for the particular user.

Changes or additions are prepared by punching the complete case. Deletions are indicated by punching the "case" number on one card which has the card code for deletions in the card type field.

A change tape is then prepared using the same file conversion program and control cards used to prepare the original tape. Both tapes must be in the same sequential "case" number order.

The file maintenance program will compare the original with the change tape and create a new, updated tape. Card input to this program consists of:

- (A) Field Code for "case" number
- (B) Width of "case" number field
- (C) Field Code signifying record deletion

5 AN INFORMATION RETRIEVAL EXAMPLE

5.1. DEFINITION OF INFORMATION, CARD LOCATION, AND FIELD CODES

| Information | Card Number | Location | Field Code | Width of Field |
|----------------|-------------|----------|------------|-----------------------------|
| Case Number | All Cards | 9-10 | 06 | 2 |
| Card Code | All Cards | 14-15 | * | 2 |
| Continuation * | All Cards | 19-20 | - | 2 |
| Project | 01 | 26-30 | 01 | 5 (right adjusted) |
| Date | 01 | 33-40 | 02 | 8 (right adjusted) |
| Company | 01 | 41-72 | 03 | 32 |
| Author(s) | 02 | 21-80 | 04 | 60 (left adjusted, blocked) |
| Title | 03 | 41-60 | 05 | 20 |

* No field code is defined for card code and continuation numbers.

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5.2. A DESCRIPTION OF THE SEARCH REQUEST (see p. 15)

(A) Search Card

The search request indicates field code 05 is to be completely scanned and any case with the word "IS" in the title is to be selected. Note that the complete word "IS" is specified by placing blanks before and after the word.

(B) SORT Card

The sort is by field code 02 (date) starting with position 7 for two columns (7-8). Thus, the sort is by year only.

(C) ALSO Card

The word ALL in column 6-8 indicates the complete record is to be included in the sorted output.

(D) The Print Card

The page width will be 80 characters. Carriage spacing at the bottom of the page will be based on a record, not a line. After a record is printed, a double space will be inserted. The title "INFORMATION RETRIEVAL EXAMPLE" will appear with the listing of the control cards.

(E) HEAD or LIST

There are no headings to appear at the top of each page—hence, no HEAD cards are present.

The first two LIST cards govern the printing of the case number. The next LIST card will print field codes 01, 02, and 03 with five spaces between the items followed by a double space. The next two LIST cards govern the printing of the authors. Since 20 positions are allowed for each name, it is considered a blocked field. By restricting the print area from column 15 to column 34, one name per line is assured.

The following two LIST cards govern the printing of the title and, finally, the LIST END card terminates the list request.

Listings of the input data cards, the specification control cards used to create the tape, the data on tape after conversion program, a completed search request form and the output showing request specifications and the retrieved data are to be found in the following pages.

WILLOW RUN LABORATORIES

5.3. A LIST OF THE INPUT DATA CARDS

| Case | Type | Card <u>Continuation</u> | |
|------|------|-----------------------------|--------------------------------|
| 01 | 01 | 01 12345 | 07/01/65UNIVERSITY OF MICHIGAN |
| 01 | 02 | 01JONES | SMITH |
| 01 | 02 | 02BAKER | ABBOTT |
| 01 | 03 | 01 | WALTERS |
| 01 | 03 | 02 | THIS TITLE IS MERELY |
| 01 | 03 | 03 | AN ATTEMPT TO CHECK |
| 01 | 03 | 04 | THE SCANNING MECHAN |
| 02 | 01 | 01 76283 | ISM |
| 02 | 02 | 01ABLE | 09/13/32FORD MOTOR COMPANY |
| 02 | 03 | 01 | BAKER |
| 02 | 03 | 01 | SMITH |
| 03 | 01 | 00456 | IRRELEVANT TITLE |
| 03 | 02 | 01WALTERS | 06/31/63AMERICAN MOTORS |
| 03 | 03 | 01 | JONES |
| 03 | 03 | 02 | THE DATE USED ON THI |
| 03 | 03 | 03 | S CASE IS AN IMPOSSI |
| 03 | 03 | 04 | BLE ONE. |
| 04 | 01 | 01 16723 | 08/12/16FORD MOTOR COMPANY |
| 04 | 02 | 01ABBOT | |
| 04 | 03 | 01 | THIS IS THE FINAL TE |
| 04 | 03 | 02 | ST CASE OF THE SERIE |
| 04 | 03 | 03 | S. |

— WILLOW RUN LABORATORIES —

5.4. A LIST OF THE SPECIFICATION CONTROL CARDS

| | 1HDR | 080965 | TEST | INFORMATION RETRIEVAL EXAMPLE |
|-------------------|---------------|--------------|------|-------------------------------|
| ID Card | | | | |
| Group Control | 3309002014002 | | | |
| | C | 06009020 | | IDENTIFICATION |
| | T01 | 01026050 | | PROJECT NUMBER |
| Field Description | | T01 02033080 | | DATE |
| | | T01 03041320 | | COMPANY |
| | | T02 04021601 | | AUTHOR(S) |
| | | T03 05041201 | | TITLE |
| End Card | E1 | | | |

WILLOW RUN LABORATORIES

5.5.5. DATA ON TAPE AFTER CONVERSION PROGRAM

INFOR 080965 TEST INFORMATION RETRIEVAL EXAMPLE

0601*0112345*0207/01/65*03UNIVERSITY OF MICHIGAN
ABBOTT BAKER
RELY AN ATTEMPT TO CHECK THE SCANNING MECHANISM
0602*0176283*0209/13/12*03FORD MOTOR COMPANY
SMITH
*05IRRELEVANT TITLE
0633*0100456*0206/31/63*03AMERICAN MOTORS
*05THE DATE USED ON THIS CASE IS AN IMPOSSIBLE ONE.
0604*0116723*0208/12/16*03FORD MOTOR COMPANY
*05THIS IS THE FINAL TEST CASE OF THE
SERIES.

Field Codes (followed by related data)

5.6. A COMPLETED SEARCH REQUEST FORM

INFORMATION RETRIEVAL REQUEST NUMBER 4
PROJECT 9/4/73

1. SEARCH ARPS
KIRK

2. SEARCH ARPS
KIRK

3. SEARCH ARPS
KIRK

4. PRINT CONTROL CARD

5. HEAD OR LIST

6. PRINT CONTROL CARD

7. INFORMATION RETRIEVAL EXAMPLE

8. SEARCH ARPS
KIRK

9. SEARCH ARPS
KIRK

10. SEARCH ARPS
KIRK

11. SEARCH ARPS
KIRK

12. SEARCH ARPS
KIRK

13. SEARCH ARPS
KIRK

14. SEARCH ARPS
KIRK

15. SEARCH ARPS
KIRK

16. SEARCH ARPS
KIRK

17. SEARCH ARPS
KIRK

18. SEARCH ARPS
KIRK

19. SEARCH ARPS
KIRK

20. SEARCH ARPS
KIRK

21. SEARCH ARPS
KIRK

22. SEARCH ARPS
KIRK

23. SEARCH ARPS
KIRK

24. SEARCH ARPS
KIRK

25. SEARCH ARPS
KIRK

26. SEARCH ARPS
KIRK

27. SEARCH ARPS
KIRK

28. SEARCH ARPS
KIRK

29. SEARCH ARPS
KIRK

30. SEARCH ARPS
KIRK

31. SEARCH ARPS
KIRK

32. SEARCH ARPS
KIRK

33. SEARCH ARPS
KIRK

34. SEARCH ARPS
KIRK

35. SEARCH ARPS
KIRK

36. SEARCH ARPS
KIRK

37. SEARCH ARPS
KIRK

38. SEARCH ARPS
KIRK

39. SEARCH ARPS
KIRK

40. SEARCH ARPS
KIRK

41. SEARCH ARPS
KIRK

42. SEARCH ARPS
KIRK

43. SEARCH ARPS
KIRK

44. SEARCH ARPS
KIRK

45. SEARCH ARPS
KIRK

46. SEARCH ARPS
KIRK

47. SEARCH ARPS
KIRK

48. SEARCH ARPS
KIRK

49. SEARCH ARPS
KIRK

50. SEARCH ARPS
KIRK

51. SEARCH ARPS
KIRK

52. SEARCH ARPS
KIRK

53. SEARCH ARPS
KIRK

54. SEARCH ARPS
KIRK

55. SEARCH ARPS
KIRK

56. SEARCH ARPS
KIRK

57. SEARCH ARPS
KIRK

58. SEARCH ARPS
KIRK

59. SEARCH ARPS
KIRK

60. SEARCH ARPS
KIRK

61. SEARCH ARPS
KIRK

62. SEARCH ARPS
KIRK

63. SEARCH ARPS
KIRK

64. SEARCH ARPS
KIRK

65. SEARCH ARPS
KIRK

66. SEARCH ARPS
KIRK

67. SEARCH ARPS
KIRK

68. SEARCH ARPS
KIRK

69. SEARCH ARPS
KIRK

70. SEARCH ARPS
KIRK

71. SEARCH ARPS
KIRK

72. SEARCH ARPS
KIRK

Definitions

| | | |
|--------------------|-------------------|--|
| F - Field Code | L - Line | F (Front) Options |
| S - Start Sort | R - Record | S (Start) Options |
| C - No. of Columns | RH - Right Margin | J - Double Spacing / Insert into line |
| W - Page Width | LW - Left Margin | I - Insert blank line S - Insert and print A - Insert, print, double space P - Print page |
| | | |

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5.7. FIRST PAGE OF OUTPUT SHOWING REQUEST SPECIFICATIONS

I.D. INFORMATION RETRIEVAL REQUEST NUMBER 1 KIRK COMP. 584 9143

SEARCH CONTROL { SRCH \$5055 IS \$
 { SRCH END

SORT CONTROL { SORT 020702
 { ALSO ALL

INFORMATION RETRIEVAL EXAMPLE

PRINT CONTROL { NUMBER OF COLUMNS = 080
 { LINE OVERFLOW = N
 { RECORD OVERFLOW = Y
 { END OF RECORD CARRIAGE CONTROL = K

HEADING { HEADING CONTROL
 { F.C. P LMAR RMAR HOLLERITH
 { NO HEADING CONTROL

LIST SPECIFICATIONS { LIST CONTROL
 { F.C. P LMAR RMAR HOLLERITH
 { XX 010 THIS IS CASE \$
 { 06 S 023
 { 01
 { 02
 { 03 S
 { XX / 010 THE AUTHORS ARE \$
 { 04 / 015 034
 { XX / 010 THE TITLE IS \$
 { 05 / 015
 { END

WILLOW RUN LABORATORIES

5.8. RETRIEVED DATA

THIS IS CASE 04

16723 08/12/68 FORD MOTOR COMPANY

THE AUTHORS ARE
ABBOT

THE TITLE IS
THIS IS THE FINAL TEST CASE OF THE SERIES.

THIS IS CASE 03

00456 06/31/63 AMERICAN MOTORS

THE AUTHORS ARE
WALTERS
JONES

THE TITLE IS
THE DATE USED ON THIS CASE IS AN IMPOSSIBLE ONE.

THIS IS CASE 01

12345 07/01/65 UNIVERSITY OF MICHIGAN

THE AUTHORS ARE
JONES
SMITH
ABBOTT
BAKER
WALTERS

THE TITLE IS
THIS TITLE IS MERELY AN ATTEMPT TO CHECK THE SCANNING MECHANISM

APPENDIX D

IRIA FILE STRUCTURES

INTRODUCTION

IRIA data files are maintained on three tapes: IRIA-Number IRIA-Master, Category-Number IRIA Master, and Category-Number IRIA-Annotation. The structure of the Master File is shown in Appendix D-1. The Annotation File structure is shown in Appendix D-2.

Creating a file requires the necessary control cards to define the tape file and fields. These are shown, along with sample data inputs and the tape file format that results from the three IRIA files, in Appendix D-3 through D-10.

IRIA Category Numbers are maintained on punched cards in the Category Heading File. When the file is used in the program, it is first loaded onto a disk pack. The file format is as follows:

| <u>Description</u> | <u>Field Code</u> | <u>Width of Field</u> | <u>Columns</u> |
|--------------------------------------|-------------------|-----------------------|----------------|
| Expanded Category Number and Meaning | 01 | 60 | 1-60 |
| Category Number | 28 | 3 | 65-67 |
| Expanded Category Number | 02 | 8 | 71-78 |

D-1 (Continued)

IRIA Master File

| <u>Contents</u> | <u>Field Code</u> | <u>Width of Field</u> | <u>(Column 7b)</u> <u>Card Type</u> | <u>Columns</u> |
|--|-------------------|-----------------------|--|-------------------|
| IRIA Serial Code | 03 | 5 | All Cards | 71-75 |
| Month Introduced | 09 | 1 | All Cards | 50 |
| Title | 01 | 50 (Multiple) | 1 | 7-51 ¹ |
| Confidential Title | 37 | 50 (Multiple) | A | 7-51 ¹ |
| Security Classification | 02 | 15 | 2 | 7-21 |
| Contractor | 04 | 50 (Multiple) | 3 | 7-51 ¹ |
| Report Number | 05 | 50 (Multiple) | 4 | 7-51 ¹ |
| Date | 06 | 20 | 5 | 7-26 |
| Contract Number | 07 | 25 (Multiple) | 6 | 7-31 |
| Astia Number | 08 | 11 | 7 | 7-17 |
| Command (DELETE or MODIFY punched in 7-12 & 13-16 blank) | 35 | 10 | * | 7-16 |
| Contractor Code | 29 | 4 | 9 | 24-27 |
| Contract Number | 10 | 5 | 9 | 28-32 |
| Department Service Code | 11 | 1 | 9 | 33 |
| Sponsoring Agency | 12 | 4 | 9 | 34-37 |
| Month of Publication | 31 | 1 | 9 | 38 |
| Year of Publication | 13 | 2 | 9 | 39-40 |
| Journal | 14 | 4 | 9 | 41-44 |
| 1 st Author Code | 15 | 4 | 9 | 45-48 |
| Abstract Number | 16 | 9 | 9 | 53-61 |
| Language Code | 17 | 1 | 9 | 62 |
| Bamirac Serial | 19 | 7 | 9 | 63-69 |
| Security Code | 20 | 1 | 9 | 80 |
| 1 st Category Word | 21 | 4 | 9 | 1-4 |
| 2 nd Category Word | 22 | 4 | 9 | 5-8 |
| 3 rd Category Word | 23 | 4 | 9 | 9-12 |

¹ Columns 52-56 must be blank for photographic reduction for publications.

D-1
(Continued)

| <u>Contents</u> | <u>Field Code</u> | <u>Width of Field</u> | <u>Card Type</u> | <u>Columns</u> |
|--|-------------------|-----------------------|------------------|----------------|
| Evaluation Code | 24 | 1 | 9 | 13 |
| Type of Report | 25 | 1 | 9 | 14 |
| 3 rd Category Number | 26 | 3 | 9 | 15-17 |
| 2 nd Category Number | 27 | 3 | 9 | 18-20 |
| 1 st Category Number | 28 | 3 | 9 | 21-23 |
| (*) = All Category Words blank | 30 ¹ | 1 | - | - |
| (M) = Modify (D) = Delete (-) = New | 32 ¹ | 1 | - | - |
| (*) = Unpublished in Quarterly | 33 ¹ | 1 | - | - |
| (*) = Unpublished in Annual | 34 ¹ | 1 | - | - |
| Error Message | 36 ¹ | Var | - | - |
| New 1 st Category Number | 38 ¹ | 3 | - | - |

After the updating of the files is complete, field codes 35, 36, and 38 are not in file. Also, field code 32 only contains a. (D) in the IRIA-NUMBER IRIA-MASTER file and this is removed after the CATEGORY-NUMBER IRIA-MASTER is updated.

¹ Computer generated field codes.

IRIA Annotation File

file follows:

| <u>Contents</u> | <u>Field Code</u> | <u>Width of Field</u> | <u>(Column 76)</u> <u>Card Type</u> | <u>Columns</u> |
|--|-------------------|-----------------------|--|-------------------|
| IRIA Serial Code | 01 | 5 | All Cards | 71-75 |
| Expanded 1 st Category Number | 02 | 6 | 8 | 65-70 |
| Annotation | 03 | 50 (Multiple) | 8 | 7-51 ¹ |
| Command (DELETE or MODIFY punched in 7-12 & 13-16 blank) | 35 | 10 | + | 7-16 |
| (*) = New (F) = Flag (!) = Modify | 32 ² | 1 | - | — |
| (*) = Unpublished Quarterly | 33 ² | 1 | - | — |
| (*) = Unpublished Annual | 34 ² | 1 | - | — |
| 1 st Category Number | 28 ² | 3 | - | — |
| Error Message | 36 ² | Var. | - | — |

Attached to this memo are a listing of the file conversion control cards, a listing of some detail cards, and a listing of the tape records created by the file conversion program.

¹ Columns 52-56 must be blank for photographic reduction for publications.

² Computer generated field codes.

A: File Conversion Control Cards for Creating A IRIA-MASTER Tape

B. Sample of IRIA Master and Bibliography Cards

C. Tape Records After File Converting Sample
of IRIA Master and Bibliography Cards

IHDR 092564IRIA BIBL IRIA MASTER AND BIBLIOGRAPHY FILE.

* L

1)†

0310040*093*01 TRANSMISSION OF THE ATMOSPHERE IN THE INFRARED. A REVIEW.
*02UNCLASSIFIED *04AIR FORCE CAMBRIDGE RESEARCH LABS. BEDFORD, MASS. #05RESEARCH REP
ORT NO. 150, AFCRL-62-814 *06JULY 1962 #07ND CONTACT NUMBER #08AD 2895
30 *29CRCA*13 *113*12CRCA*317*1362*14 *15JUN.1963*35117*19 *201*21AT*0*22 *23
*242*253*26 *27 *28330*1

0310343*39 *01 INVESTIGATION OF THE INFRARED ABSORPTION
DS *02UNCLASSIFIED *04BATTELLE MEMORIAL INST. *05SOLAR, O. *06TECHNICAL
CUMENTARY REPORT NO. ASC TR 61-722 *06MARCH 1962 *07AF 23(616)-7162
13 *2941111057162*113*12*ADC*313*1362*14 *15RJAK*16YAD27561341 *07 *08
*242*250*26 *27830*28742*14

0310544*19 *011. RESEARCH CONCERNING INFRARED EMISSIVITY
REMENTS *02UNCLASSIFIED *04SYRACUSE UNIVERSITY, SYRACUSE, N. Y. #05FINAL REPORT
AFCPL-62-869 *06AUGUST 1962 *07AF 19(604)-3908
17 *29SYR*1203908*113*12CRCA*31*1362*14 *15RPAU*16XAU2*7517117 *19 *201*21EKS*122 *23
*241*254*26 *27420*28330*1

1)†

1EOF
1†

D-5

D. Tape Records as They Appear On IRIA-NUMBER IRIA-MASTER Tape

IRIA MASTR

1)†

*)†

0310043†28742†27830†26 †214TM0†22 †23 †30 †242†12CRCAT1362†15JHOW†231†29CRCAT317†32 †33 †34
†105†16XA0289530†253†113†14 †17 †19 †02UNCLASSIFIED 0993†04AIR FORCE CAMBRIDGE RESEARCH
CH LABS., BEDFORD, MASS.†C5RFSEARCH REPORT NO. 150, AFCLR-62-914
†07NO CONTRACT NUMBER †READ 289 530 †01TRANSMISSION OF THE ATMOSPHERE IN THE INFRARED-- A REV
16W
0310043†28742†27830†26 †215P†2†22 †23 †30 †242†12WACC1352†15RJAK†2†1†29RTH†313†32 †33 †34
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RACUSE, N. Y.
†05FINAL REPORT AFCLR-62-369
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1)†

E. Tape Records as They Appear On CATEGORY-NUMBER IRIA-MASTER Tape

IRIA MASTER

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03105443†28330†27
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CH LAES., BEDFORD, MASS.†05RESEARCH REPORT NO. 150, AFCRL-62-114
†07NO CONTRACT NUMBER †GEAD 289 53C †01TRANSMISSION OF THE AIRBORNE IN THE INFRARED-- A REV
IEW
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03105444 22330†27420†26 †21AN0†22 †23 †3C †242†12CRCA†136,2†15JUN0†201†29CRCA†317†32 †33 †34
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II. ATMOSPHERIC OPTICAL NOISE MEASUREMENTS †20UNCLASSIFIED †09 †4SYRACUSE UNIVERSITY, NY
†05FINAL REPORT AFCRL-62-369
†07AF 19(6,04)-39C3 †08AD 287 517 †††

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SPECIUM OF SELECTED AROMATIC COMPOUNDS †09 †4SYRACUSE UNIVERSITY, NY
, COLUMBUS, OH. †05TECHNICAL DOCUMENTARY REPORT NO. ASD TR 61-722 †26MARCH 1962
†08AD 276 413 †††

†††

F. File Conversion Control Cards for Creating A IRIA-ANNOTATION Tape

LHR 092564 IRIA ANNOTATIONS IN 1 ST CATEGORY NUMBER ORDER + L
3071005376001
C 0107105 IRIA SERIAL CODE
T 8 0206506 EXPANDED 1 ST CATEGORY NUMBER
T 8 0305711 ANNOTATION NUMBER
I+ 3503710 COMMAND DELETE OR MODIFY
E1

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6. Sample of IRIA Annotation Cards

A 26-PAGE REPORT DISCUSSING RECENT TECHNIQUES
DEVELOPED TO CALCULATE THE INFRARED SLANT PATH
TRANSMISSION. ENOUGH DATA AND FIGURES ARE GIVEN
TO PERFORM APPROXIMATE CALCULATIONS.
INVESTIGATES REASON FOR ANALYZING NATURE OF
SUBSTANTIUMS ON BENEFIC RINGS BY MEANS OF LOW-
FREQUENCY IR ABSORPTION.
THIS REPORT IS CONCERNED WITH CONTRAST MASTERS
OR FERRARI PROJECTS ONCE CERTAIN CONDITIONS,
AS WITH SITUATION EFFECTS IN ATMOSPHERIC
TRANSMISSION, WHICH WERE FOUND TO BE LARGELY
FLATNESS VARIATIONS.

H. Tape Records After File Converting Sample of IRIA Annotation Cards

1HDR 092564IRIA ANOTIRIA ANNOTATIONS IN 1 ST CATEGORY NUMBER ORDER * L
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))†
011C040†02030300†03A 20-PAGE REPORT DISCUSSING RECENT TECHNIQUES DEVELOPED TO CALCULATE THE TYPE
ARED SLANT PATH TRANSMISSION. ENOUGH DATA AND FIGURES ARE GIVEN TO PERFORM APPROXIMATE CALCULAT
IONS.
011C043†02070402†03 INVESTIGATES METHOD OF ANALYZING NATURE OF SUBSTUTENTS ON RINGE RINGS.
Y MEANS OF LOW- FREQUENCY IR ABSORPTION.
011C044†02030300†03 THIS REPORT IS CONCERNED WITH CONTRAST WASHOUT OF CERTAIN OBJECTS UNDER CERTAIN
N CONDITIONS, AND WITH SCINTILLATION EFFECTS IN ATMOSPHERIC TRANSMISSION, WHICH WERE FOUND
TO BE LARGELY INTENSITY VARIATIONS.
))†
1EOF
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I. Tape Records As They Appear On CATEGORY-NUMBER IRIA-ANNOTATION Tape

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0110-43428330†32 †33 †34 †0110040†0203030†C3A 20-PAGE REPORT DISCUSSING RECENT TECHNIQUES
OPER TO CALCULATE THE INFRARED SLANT-PATH TRANSMISSION. ENOUGH DATA AND FIGURES ARE GIVEN
TO PER D-10
REFOR APPROXIMATE CALCULATIONS.
))†

0110-44428330†32 †33 †34 †02030370†C3 THIS REPORT IS CONCERNED WITH CONTRAST WASHOUT
OBJECTS UNDER CERTAIN CONDITIONS. AND WITH SCINTILLATION EFFECTS IN ATMOSPHERIC
WHICH WERE FOUND TO BE LARGELY
INTENSITY VARIATIONS.
))†

0110-543†29742†32 †33 †34 †0110043†C2970432†03 INVESTIGATES METHOD OF ANALYZING NATURE OF
INFLUENTS ON BENZENE RINGS BY MEANS OF LOW-FREQUENCY IR ABSORPTION.
))†

0110-543†29742†32 †33 †34 †0110043†C2970432†03 INVESTIGATES METHOD OF ANALYZING NATURE OF
SUBST
))†

APPENDIX E

IRIA FILE UPDATING RUNS

INTRODUCTION

Information in Appendix E is extracted from the following memoranda by L. Launstein, dated October 13, 1965, written to the IRIA File:

1. How to Update IRIA-Number IRIA-Master Tape
2. How to Update the Category-Number IRIA-Master Tape
3. How to Update the Category-Number IRIA-Annotation Tape

How to Update IRIA-Number IRIA-Master Tape

Preparation of Cards

The cards required to enter the information for a new document, modify information for an old document, and delete the information for an old document are discussed below. The descriptions of the bibliography and master cards are given in the "Definitions of IRIA Files for Computer Processing." Note that the information from the annotation cards is not in the IRIA-Master files.

To Enter Information for a New Document

The card types, 1, A, 2, 3, 4, 5, 6, 7, and 9 are used to enter information for a new document. Any other card type, except a type 1 card, will be listed as an unused card. The type "+" card will be caught when it tries to enter the file. This will cause the record to be listed in the error record listing with the comment "NO RECORD FILE TO" at the top and the contents of columns 7-16 of card type at the bottom.

If card types 1, 2, 3, 4, 5, and 6 are not all present, the record will be listed in the error records with "MISSING FIELD" printed above the record. Depending on which field is missing, one of the comments

"** TITLE," "** CLASSIFICATION," "** CORP AUTHOR," "** REPORT NO.," "** DATE," or "** CONTRACT NO." will be printed in place of the missing field.

To Modify the Information for an Old Document

The particular card type to be modified or added is punched in its entirety. A type "+" card must be present with the characters "MODIFY" punched in columns 7-12. Otherwise, the record will be listed in the error record listing with the comment "ERRONEOUS ADDITION RECORD. RECORD OF SAME IRIA NUMBER LEFT IN FILE UNCHANGED."

Type "+" card is not needed for a type "9" card with a non-blank first category number to modify a record that is already there, provided the old record didn't contain a non-blank first category number. Although, a type "+" card being present is not an error.

A type "9" card with a new first category number and a type "+" card with the characters "MODIFY" punched in 7-12 will change the master information on the IRIA-MASTER tapes, will reposition the modified record on the CAT-NUMBER IRIA-MASTER tape and will change the first category number and reposition the annotation on the CAT-NUMBER IRIA-ANNOTATION tape. The last two are completed at the time the CAT-NUMBER IRIA-MASTER tape is updated.

To Delete the Information for an Old Document

To delete the information for an old document a type "+" card is punched with the characters "DELETE" punched in columns 7-12. This one card deletes the record from the IRIA-NUMBER IRIA-MASTER tape. When the CAT-NUMBER IRIA-MASTER tape is updated, the record is also deleted from that tape and from the CAT-NUMBER IRIA-ANNOTATION tape.

Comments

If a type "+" card has anything other than "DELETE" or "MODIFY" punched in columns 7-12, the record will be listed in the error records with the comment "ERRONEOUS ADDITION RECORD. RECORD OF SAME IRIA NUMBER LEFT IN FILE UNCHANGED." The contents of columns 7-16 will also be listed.

Any record that is modified is not checked for the presence of field codes . 01, 02, 03, 04, 05, 06, and 07. Therefore, a bibliography that is added for an old master card can enter the file with one of the above field codes missing.

The field code 10 is not present in the maintained files. The computer program generates the field code 32 with a "D" for "DELETE" an "M" for "MODIFY", or a "*" for a new document. When a new document enters

the file, the field codes 33 and 34 are also generated with an "*" in them.

Whenever the first category word is the same as the third category word, the computer program generates a field code 30 with an "*" in it. Otherwise, the field code 30 contains a blank. Therefore, a "*" in field code 30 signifies that all category words are blank.

Until the CAT-NUMBER IRIA-MASTER tape has been updated, the IRIA-NUMBER IRIA-MASTER tape contains any records that are to be deleted with a "D" in field code 32. Also, whenever the first category number of a record changes, a record is generated consisting of the old fast search field codes, a field code 38 containing the new first category number, and a "D" in field code 32.

If the number of characters for one document exceeds 1000, the cards containing the unused information are listed. Any "4-8" punches in the fields of field codes 01, 04, 05, or 07 are converted to "--" punches.

Preparation of the Update Deck

All cards for the update run are placed together. The cards for any one document (IRIA number) must be together. Any continuation cards must be in sequence.

Updating of the IRIA-NUMBER IRIA-MASTER Tape

The update deck is used as input to the WR-128 program. The output from the program is a listing of the records that entered the tape, a listing of the records that didn't enter the tape, and a tape reflecting the new additions, modifications, deletions, and old IRIA-NUMBER IRIA-MASTER tape.

2. How to Update the Category-Number IRIA-Master Tape

The CAT-NUMBER IRIA-MASTER tape is updated by requesting program WR-129 to be run. The program needs no input cards. The program searches the new additions, modifications, and deletions from the IRIA-NUMBER IRIA-MASTER by pulling all records with the field of field code 32 and the field of field code 28 non-blank. The pulled records are then sorted into first category number order. Then the CAT-NUMBER IRIA-MASTER tape is updated.

If any records were deleted or had first category number changes, the annotations are pulled from the CAT-NUMBER IRIA-ANNOTATION, modified, and used to update the CAT-NUMBER IPIA-ANNOTATION tape.

The output consists of a listing of the records entered on the CAT-NUMBER IRIA-MASTER tape and on the CAT-NUMBER IRIA-ANNOTATION tape, plus the new up to date tapes.

3. How to Update the Category-Number IRIA-Annotation Tape

Preparation of Cards

Only the annotation cards (type "8" cards) are needed to enter a new annotation.

To modify an annotation already on tape, the annotation cards (type "8" cards) and the type "+" card with the characters "MODIFY" punched in columns 7-12 are needed.

To delete an annotation from the tape, a type "+" card may be used. However, the deletion of the bibliography also deletes the annotation.

Preparation of the Update Deck

The annotation cards with any type "+" card are put together. The annotation cards must be in continuous sequence for each document (IRIA number). Also, any type "+" cards must be with any annotation cards for a document.

Updating of the CAT-NUMBER IRIA-ANNOTATION Tape

The WR-130 program is used to update the CAT-NUMBER IRIA ANNOTATION tape. The program uses the update deck as input. The program's output is a listing of annotations that entered the CAT-NUMBER

IRIA-ANNOTATION tape plus an up to date tape. There is also a listing of the annotations that didn't enter the tape (see comments below).

Comments

If there is no first category number on the IRIA-NUMBER IRIA-MASTER tape for an annotation, the comment "NO FIRST CAT NUMBER IN IRIA MASTER FILE," and the annotation are listed in the error listing.

If any cards are present besides type "+" and "8" cards, they will be listed as unused. But at least the IRIA number will be in a record on the update tape. If the annotation is missing, the IRIA number for this document and the comment "ANNOTATION IS MISSING," will be listed in the error listing.

If anything other than "DELETE" or "MODIFY" appear in columns 7-12 of a type "+" card, the error listing will contain the comment " I CAN NOT DO THIS," the annotation, and the erroneous command.

If an annotation is over 1000 characters, the excess annotation cards are listed.

When a new annotation enters the tape, the fields of field codes 32, 33 and 34 are set to "*"s. If the command "MODIFY" is present,

E-9

the field of field code 32 contains a "M".

A program is available to flag the annotations that have had the corresponding bibliography modified. This is done by placing an "F" in the field of field code 32.

The field codes 35 and 36 are not in the maintained CAT-NUMBER IRIA-ANNOTATION tape.

APPENDIX F

**IRIA QUARTERLY ANNOTATED
BIBLIOGRAPHY AND INDEX RUNS**

INTRODUCTION

Appendix F is taken from a memo, "How to Produce a Quarterly Annotated Bibliography and Index," from L. Launstein to the IRIA File, dated October 14, 1965.

Before a quarterly Annotated Bibliography is printed, the CAT-NUMBER IRIA-MASTER and CAT-NUMBER IRIA-ANNOTATION tapes must be up to date. For the procedures on how to update the tapes, see the memos entitled "How to Update IRIA-NUMBER IRIA-MASTER Tape," "How to Update the CAT-NUMBER IRIA-MASTER Tape," and "How to Update the CAT-NUMBER IRIA-ANNOTATION Tape."

Printing a Quarterly Annotated Bibliography

A quarterly Annotated Bibliography is printed by requesting that the program WR-131 be run. The program pulls all of the annotations off the CAT-NUMBER IRIA-ANNOTATION tape that have an "*" in the field of field code 33. Since the field of field code 33 is cleared to a blank after printing a quarterly annotated bibliography, all of the annotations added to the tape since the last quarterly Annotated Bibliography are pulled for printing.

The program prints the bibliography and the corresponding annotation for all of the pulled annotations. Whenever the first category number changes, the first category number's meaning is looked up in a dictionary stored on a disk and printed preceding the bibliographies and annotations for that first category number.

If the program cannot find a bibliography for an annotation, the program prints "BIBLIOGRAPHY IS MISSING" and then the annotation.

If the program cannot find the meaning for a first category number, preceding the bibliographies and annotations for that first category number, the program prints "NO CAT HEADING FOR" and the first category number.

The program can print the bibliographies and annotations for all of the pulled annotations by placing an "=-E" card behind the program deck. To start printing the bibliographies and annotations at the first category number "XXX", a card with "28XXX#/" punched in columns 1-7 is placed before the "=-E" card.

Printing the Index for a Quarterly Annotated Bibliography

The Index for a Quarterly Annotated Bibliography is printed by requesting that the program WR-132 be run. The tape containing the pulled annotations used to print the Quarterly annotated bibliography is needed as input to the program.

The program sorts the pulled annotations into IRIA number order. By matching the sorted tape with the IRIA-NUMBER IRIA-MASTER tape and finding expanded first, second, and third category numbers in the disk dictionary, the index line for the document is printed.

If the program cannot find a record on the IRIA-NUMBER IRIA-MASTER tape corresponding to a record on the sorted pulled annotations tape, the

IRIA number and the comment "IS MISSING FROM IRIA-NUMBER IRIA-MASTER TAPE" are printed. If a category number is not in the disk dictionary, the program prints the non-expanded category number.

To print the index for all of the annotations on the sorted pulled annotations, the program deck ends with the "=:E" card. To start printing the index at IRIA number XXXXX, a card with "01XXXXX#/" punched in columns 1-9 is inserted before the "=:E" card.

Clearing the Field of Field Code 33

The field of field code 33 is cleared by requesting program WR-133 to be run. The program replaces any "*" 's on the CAT-NUMBER IRIA-ANNOTATION tape with blanks, so that the tape is ready for the next quarters annotations. Note that the field of field code 33 must not be cleared until the final copy of a Quarterly Annotated Bibliography has been printed. Also, all new annotations added to the tape since 33 was cleared last are printed the next time.

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be no higher than the security classification of this document)

| | | |
|---|--|--|
| 1. ORIGINATING ACTIVITY (Corporate Author) BOOZ · ALLEN APPLIED RESEARCH, INC. 4733 Bethesda Avenue Bethesda, Maryland 20014 | | 2. SECURITY CLASSIFICATION Unclassified |
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|---|--|--|
| 3. REPORT TITLE Mechanization Study of the VESIAC, BAMIRAC and IRIA Information Centers, University of Michigan | | |
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| 4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Final Report of on-site survey | | |
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| 5. AUTHOR(S) (Last name, first name, initial) G. A. Kershaw, D. Crowder, J. E. Davis, E. G. Loges, E. Merendini, S. M. Thomas | | |
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|-----------------------------------|------------------------------|---------------------|
| 6. REPORT DATE September, 1966 | 7. TOTAL NO. OF PAGES 103 | 8. NO. OF PICS 2 |
|-----------------------------------|------------------------------|---------------------|

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| 9. CONTRACT OR GRANT NO DSA-7-15489 | 10. ORIGINATOR'S REPORT NUMBER 914-1-36 |
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|----------------|---|
| 11. PROJECT NO | 12. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) AD 640 130 |
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| 13. AVAILABILITY LIMITATION NOTICES Distribution of this Document is unlimited | |
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|---------------------------------|--|
| 14. SUPPLEMENTARY NOTES None | 15. SPONSORING MILITARY ACTIVITY Defense Supply Agency Defense Documentation Center Cameron Station, Virginia |
|---------------------------------|--|

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| 16. ABSTRACT Three information and analysis centers of the Institute of Science and Technology, University of Michigan, utilize the computer and EAM facilities of the Institute's Computation Department for retrieval of bibliographic references based upon the Computation Department's generalized retrieval system. The three centers are Infrared Information Analysis Center (IRIA), VELA Seismic Information Analysis Center (VESIAC), and Ballistic Missile Radiation Analysis Center (BAMIRAC). IRIA utilizes the mechanized retrieval program, which uses an IBM 1401 computer, to produce two listings. VESIAC is in the pilot stage of producing demand bibliographies using the mechanized information retrieval program. BAMIRAC utilizes an optional arrangement of manual, EAM, and mechanized techniques to provide demand bibliographies including abstracts. The development of a generalized retrieval program for all three centers has eliminated the need for the more costly process of maintaining a specialized program for each center. Because of center similarities, this general program fits each center's requirements without significant difficulty. | |
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Security Classification

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| 14 KEY WORDS | | LINK A ROLE W ₁ | | LINK B ROLE W ₂ | | LINK C ROLE W ₃ | |
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